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ILLUSTRATED

GENERAL CATALOGUE
OF



THE BUFFALO

STEEL PLATE STEAM AND PULLEY FANS,
HORIZONTAL AND UPRIGHT STEAM ENGINES,
HOT BLAST STEAM HEATING APPARATUS,
BLOWERS AND EXHAUSTERS,
DISK VENTILATING FANS,
HAND AND POWER BLACKSMITH DRILLS,
PUNCH, SHEAR AND BAR CUTTERS,
STATIONARY FORGES,
PORTABLE FORGES,
HEATING FORGES, ETC.

BUFFALO FORGE CO.

BUFFALO, N. Y.

U. S. A.

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INTRODUCTION.

As a result of unequaled merit and the universal progress in metal working industries, Buffalo Forges have, undoubtedly, become as well known to every mechanic as any tool before the public.

Extending back to the origin of the first perfect machine, our energies have been solely devoted to their improvement, and the production of kindred apparatus, which constitutes our present large lines of manufacture. The same high grade of material, and careful attention to every detail, that has characterized the success of Buffalo Forges, is a distinguishing feature of everything produced by this house.

Much valuable information gained from the successful installation of many of the largest plants yet erected, in which are employed Buffalo Blowers, Exhausters, and Hot Blast Heating Apparatus, is presented herewith. As to the practical value, data thus originating cannot fall short of meeting with wide demand and careful preservation by engineers and architects; it is not to be compared with theoretical calculations published by other manufacturers, which, at the best, are unreliable. It should be borne in mind, therefore, that the formulas and tables on the movement of air by Buffalo Fans, resistance of air in pipes, etc., are based solely on actual tests under a variety of conditions, with the most improved instruments and devices, involving much time and expense.

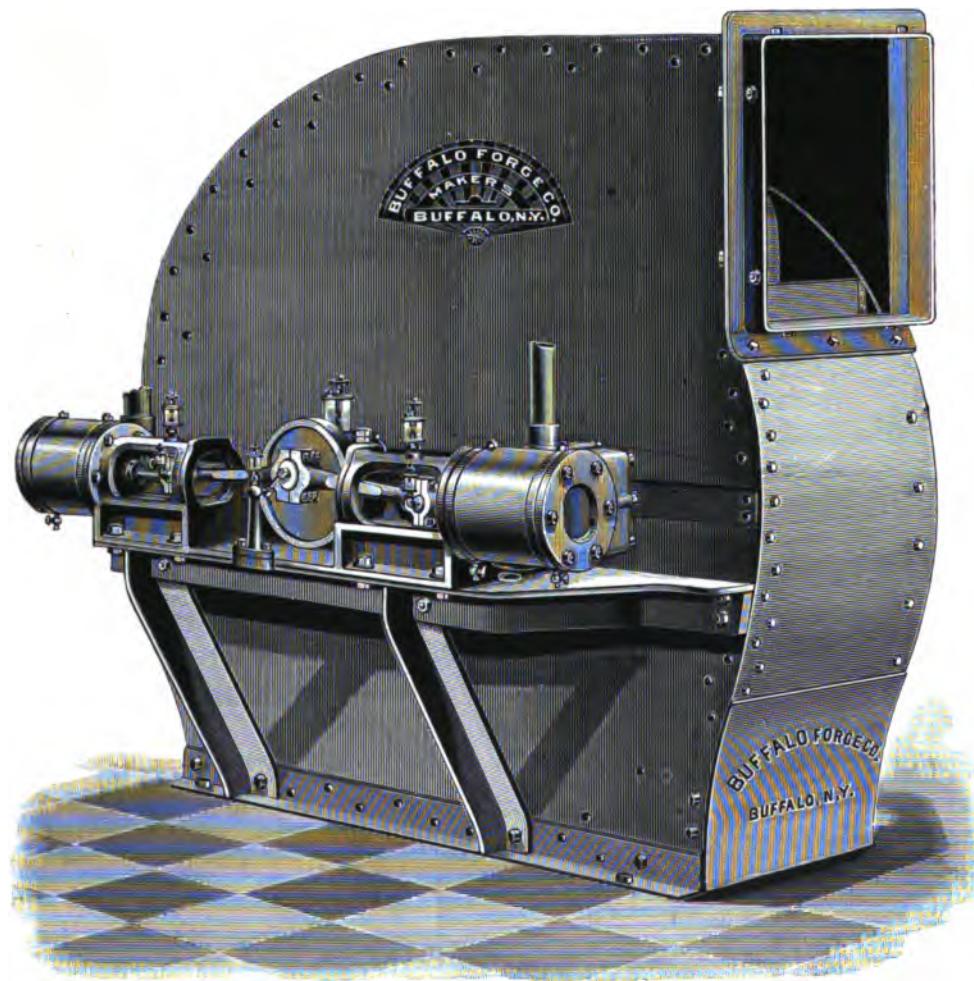
As the most suitable acknowledgment we can make of the wide appreciation of our efforts, which has always been so pleasantly apparent, and the best evidence that we are fully alive to all that is required to keep abreast of the constant advance in manufacturing pursuits, we present this new catalogue of Buffalo machines. Sectional catalogues are published of the various branches of our manufacture, such as Blowers and Exhausters, Brick and Lumber Drying, Heating and Ventilating, etc.

For the manufacture of the lines of machinery described herewith, our works are, as they always have been, the best equipped in the world. A larger number of new and special tools will not be found in any like manufactory. New buildings are constantly being added, and the working force increased in order that our plant may be ample for the steady growth of the business. Our resources are exclusively devoted to the production of the highest grade of machines, and we do not attempt to argue that any inferior detail is equal to the best, merely for lowering the cost of manufacture; the best is none too good for Buffalo goods. We are always well content to let our work speak for itself, through the very practical medium of the machines we place upon the market; merit alone tells, and nothing further is asked than an unbiased investigation of their construction and running records.

BUFFALO FORGE CO.,

BUFFALO, N. Y.
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Buffalo Special Steel Plate Steam Fan.



Double Direct Connected Horizontal Engine. Fan, Left Hand,
Top Horizontal Discharge.

Buffalo Special Steel Plate Steam Fans.

FOR the reason that Buffalo Special Steel Plate Steam Fans are generally used to accomplish unfrequent results, the nature of which often demands a variation in the form of construction even for the same class of service, they are usually built to order. No standard list of these fans can here be presented which would cover all requirements. They are built in a large variety of sizes and styles, the dimensions of the fans being in each instance so proportioned as to especially adapt them to the work which it is desired to perform. A size and type of engine of ample power is selected which is well qualified to withstand all that is required of it under existing conditions. For high pressure or velocities of air, it would be necessary to run Steam Fans, as ordinarily built, at so high a rate of speed that the life of the engine would be of short duration. To overcome this difficulty for all such service, Buffalo Special Steel Plate Steam Fans are built with a narrower wheel, the diameter being much greater than the usual proportion. The result is a high pressure of air secured by giving to the wheel a large peripheral velocity, and delivering the air through a comparatively small outlet. The engraving on page 9 is a good illustration of fan proportions for such duty.

Six special designs of Buffalo Steam Fans are illustrated by the accompanying wood cuts. The one appearing on the opposite page was built in 1887 for the United States Monitor "Miantonomah." The work required of the fan was to produce forced draft under the steamboat boilers, and also to ventilate different portions of the vessel. The conditions of the installation, which are common for similar work, necessitated strong, substantial construction and the best grade of engine for high speed under continuous use. The arrangement and design of the engines is such that each has ample capacity to drive the fan independently. Both engines may be operated simultaneously, if desired, or the fan may be driven by either alone, thus always having one engine in reserve in case of accident, as is customary in electric plants. The desirability of this feature is clearly apparent, as the fan must be operated continuously, and, in the event of accident to one engine, it is unnecessary to stop the fan while making repairs.

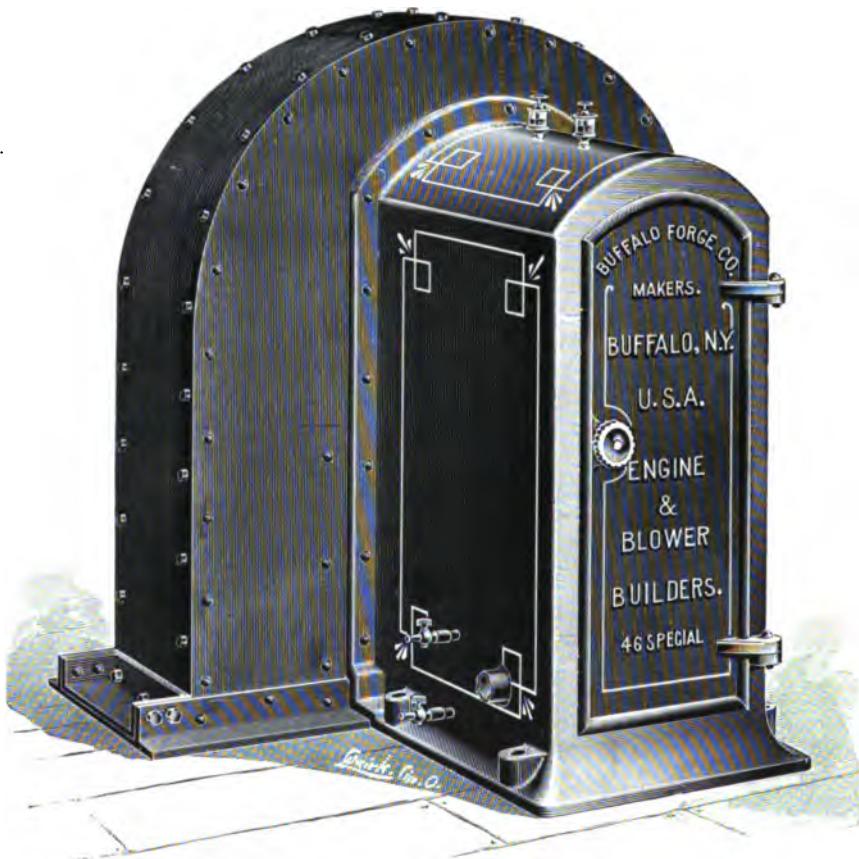
The engraving appearing on the succeeding page illustrates a type of fan constructed with Single Vertical Enclosed Engine for the United States Steamer "Galena." These machines were used for forced draft under the boilers, and the conditions of application were such that it was necessary to build four blowers in two sizes, in order to accomplish the desired results in the peculiar space at command for the position of the fans.

Generally speaking, for marine and other duty requiring continuous operation, the double type of engine is to be preferred to the single, unless there is an equipment of duplicate plants which are alternated in running. In an example like this, a single engine, properly designed and constructed, will render efficient service, and requires only ordinary attention.

Since the practice of applying Buffalo Steel Plate Steam Fans for forced draft and ventilation has proven so eminently successful in the great ocean vessels, they are now not only being universally employed for all large boats, but are adapted to smaller ones as well. Small steamships can be ventilated and supplied with a forced draft system for their boiler fires as readily, and with results equal to those of the larger ones.

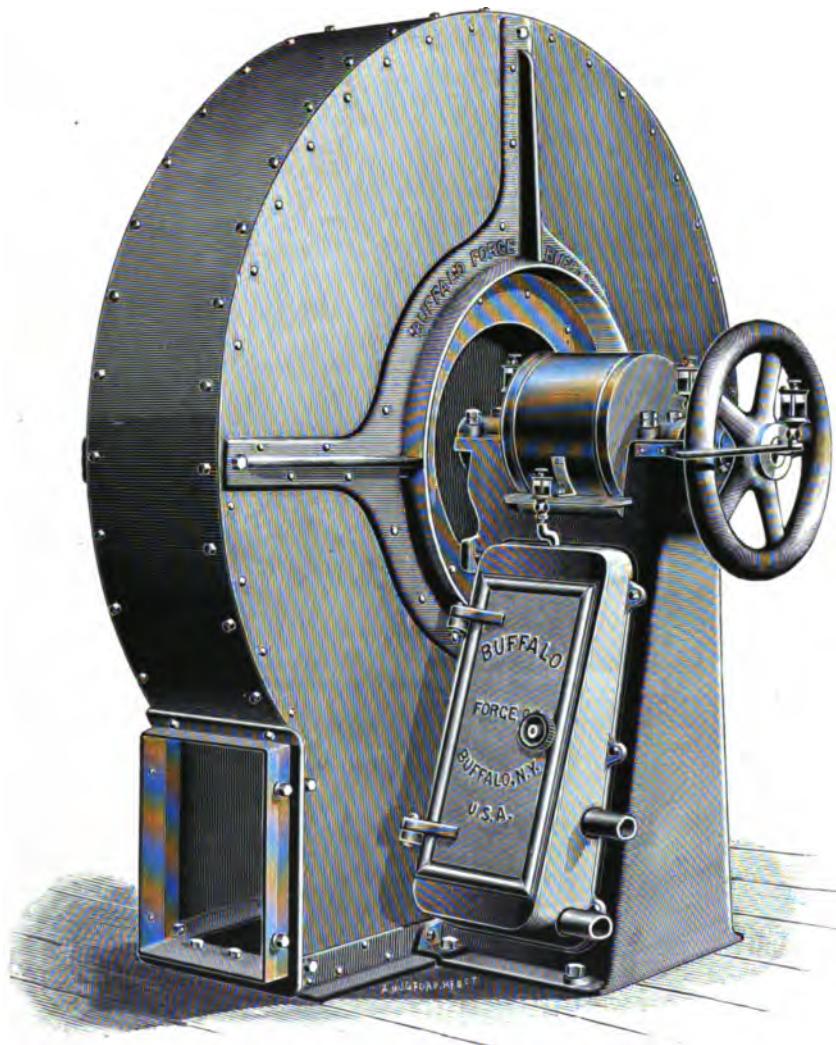
The engravings appearing on pages 8 and 9 are excellent examples of the styles and sizes of fans used for the more diminutive boats. For continuous running, and especially for high speed, the Double Upright Enclosed Engine, illustrated on page 9, embodies the acme of efficiency and durability. The engraving was reproduced direct from a photograph, two of these machines being supplied for Steamers "Pilot" and "Priam." In all machinery used on shipboard, the desire constantly evinced is to secure the greatest compactness of form, but this must be at no expense of efficiency. With all Buffalo Steel Plate Fans, special or regular, due attention is given to this feature, together with simplicity of parts.

Buffalo Special Steel Plate Steam Fan.



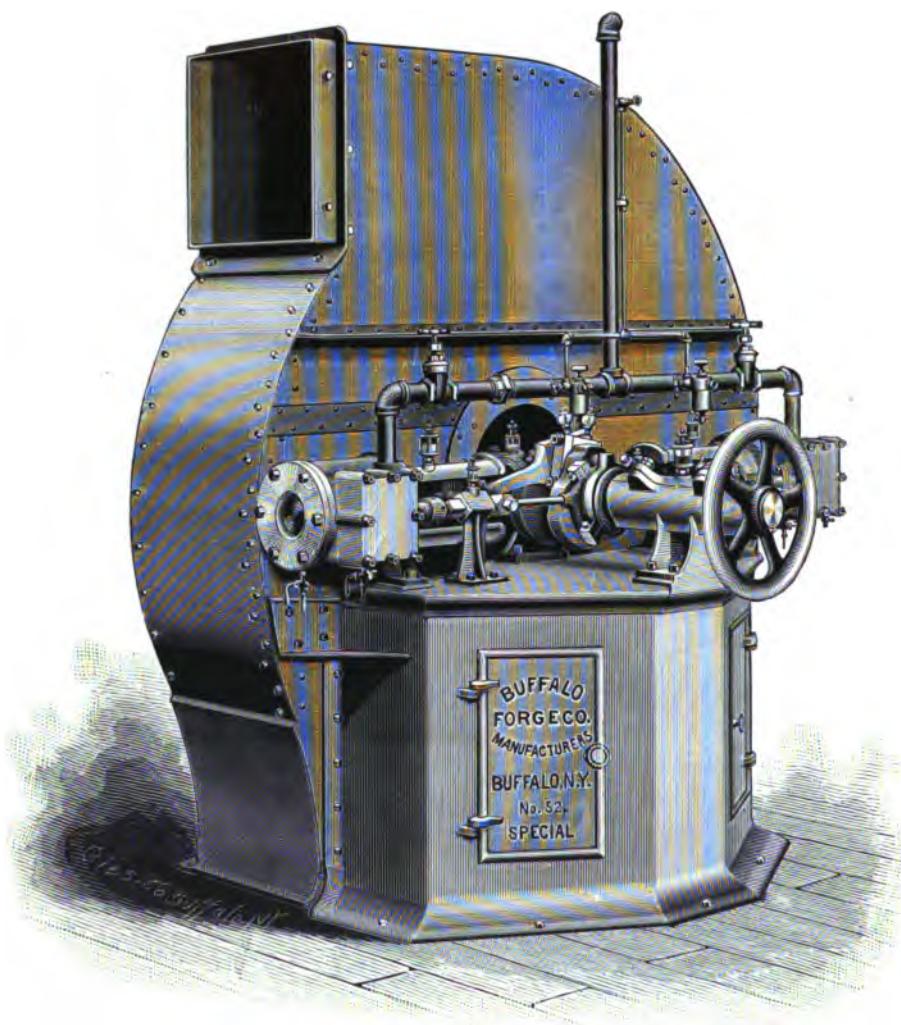
Single Enclosed Upright Engine, Cylinder beneath the Shaft. Fan, Right Hand, Down Blast Discharge, with Overhung Wheel.

Buffalo Special Steel Plate Steam Fan.



Double Enclosed Upright Engine, Cylinders beneath the Shaft. Fan, Right Hand, Bottom Horizontal Discharge, with Overhung Wheel.

Buffalo Special Steel Plate Steam Fan.



Double Direct Connected Horizontal Engine. Fan, Right Hand, Top Horizontal Discharge, with Overhung Wheel.

Buffalo Special Steel Plate Steam Fans.

Especially Adapted for Marine Duty.

DURING the past few years, Buffalo Steel Plate Steam Fans have been introduced extensively into ocean steamships. While, in many instances, they are desired for and constructed to the one end of inducing perfect combustion of fuel and obtaining the greatest steaming capacity of the boilers, they may usually be arranged to serve the double purpose of ventilating the entire ship, as well as blowing the furnaces.

By the use of Buffalo Steel Plate Steam Fans, the full effectiveness of the steamboat boilers is always assured, and it is entirely independent of the direction or force of the wind. By the proper application of these fans to marine boilers, so marked an increase of speed to the vessels has been noticed over their previous time, that owners of certain lines, who have observed the benefits derived from an initial fan, are speedily installing them into all their boats. In the example of marine boilers, especially, it is desirable to produce the largest amount of steam with the smallest amount of boiler space. Since the introduction of Buffalo Steel Plate Fans to this work, the space required for a given boiler capacity has been very materially reduced.

In steamers equipped with Buffalo Steam Fan ventilation, the old form of ventilating pipes, the efficiency of which is very low and never reliable, especially under unfavorable conditions of the weather, is entirely dispensed with; the whole dependence is, therefore, placed upon the fan.

The first Steam Fan ever applied to a shipload of fruit (see page 10) was furnished by us for the West Indies Fruiting Steamer "Neptuno." Wonderful results have been accomplished by the use of this fan, and also by a large number of other Buffalo Steel Plate Fans upon similar boats. The machine is so placed in the "Neptuno" as to blow into the fire room, which is practically air tight, and the air forced by the fan creates a uniform pressure therein. This may be regulated according to the speed of fan, of from two to five inches water column, and the air naturally seeks an escape through the readiest outlets, viz. the boiler grates.

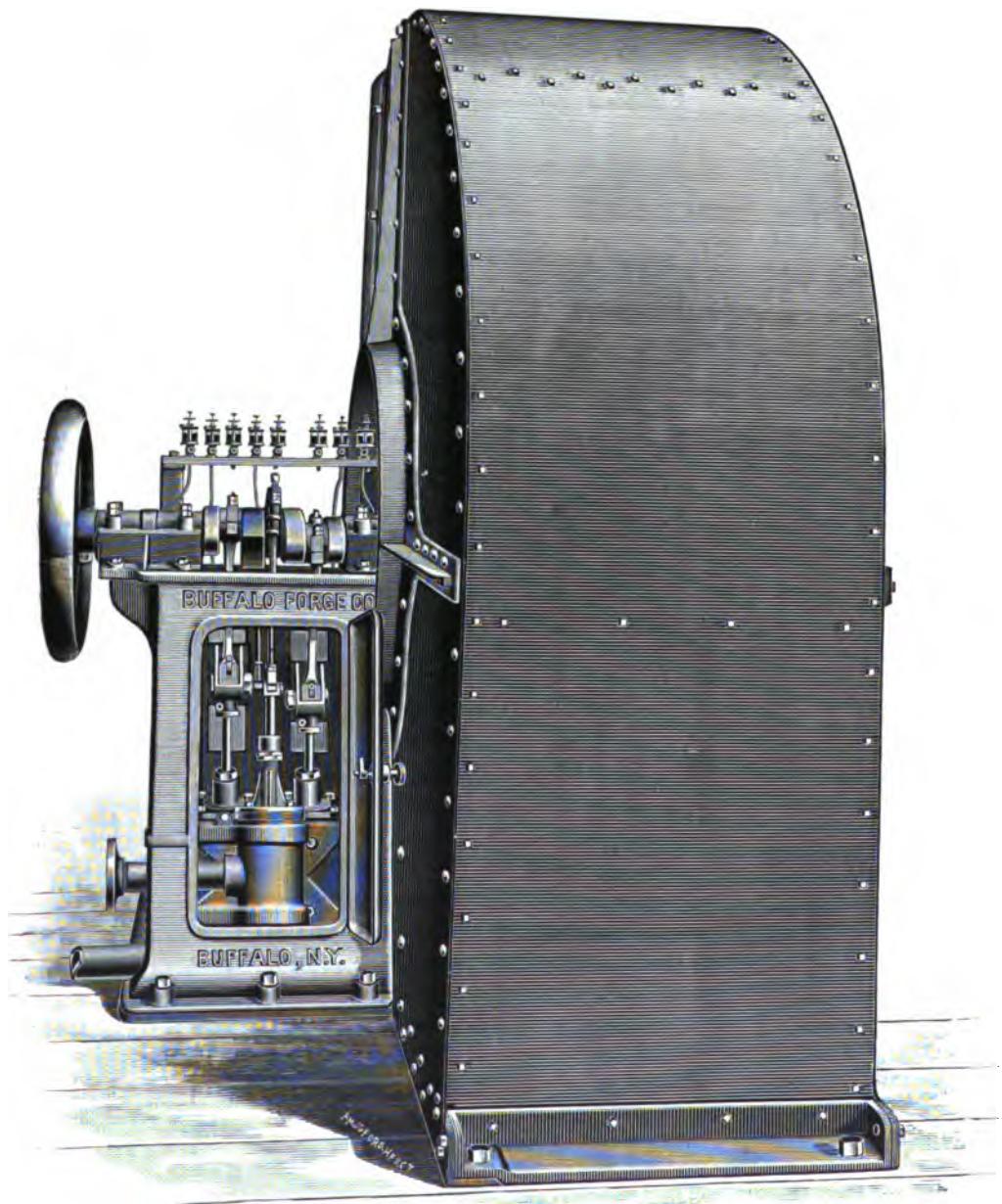
In the "Neptuno's" hold, thousands of bunches of bananas and other fruits are stored. Though the ship may be deterred from completing its trip in the usual time, the fruit invariably arrives in a remarkably preserved condition, the loss by decay being hardly noticeable, while formerly often a very great item. We give below an extract of report from Mr. John MacIntyre, a marine engineer of large resource and experience, upon the "Neptuno" Fan, applied under his system of ventilating arrangement of fruiting vessels:

"The 'Neptuno' has been running constantly for the past 19 months; she has made 35 voyages to Jamaica, and not met with any accident whatever. Steam pressure never varies even when cleaning fires, and fruit is always green. The blower has increased her speed two miles an hour, a point greatly appreciated by all interested in fruiting steamers, and also to many owners who wish for speed without ventilation. Since completing her 35th voyage after the installation of the blower, I have thoroughly examined the 'Neptuno' fan; a better built and well-knit machine it would be hard to find."

The economy in using Buffalo Steel Plate Steam Fans for fruiting steamers cannot be more clearly portrayed than in the fact that the cost is often more than saved in the decrease of the percentage of loss by decay in a single trip. The fan replaces the air in the steamer "Neptuno" once every minute and a half.

Especial attention is called to the several forms of engines adapted to all requirements, which may be readily furnished. The illustrations on pages 9 and 12 show the latest developments in engine construction for fans which must run continuously at high speeds, and frequently in situations where considerable dust is present in the atmosphere.

Buffalo Special Steel Plate Steam Fan.



Double Enclosed Upright Engine, Cylinders beneath the Shaft. Fan, Right Hand,
Top Horizontal Discharge, with Overhung Wheel.

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Buffalo Special Steel Plate Steam Fans.

Buffalo Double Upright Enclosed Engine.

THE sole aim in producing this design of engine was to secure a type which would develop a large amount of power at high rotative but moderate piston speed, common to work required of Steam Fans for forced draft duty, of Buffalo Steel Pressure Blowers for cupolas, and of the Buffalo "B" Volume type for burning bagasse and other special fuel. While some of the engine features are novel, no deviation has been made from well established laws in design and proportion for the sake of novelty; but each detail has been designed to perform its especial function, and to create a compact and symmetrical machine.

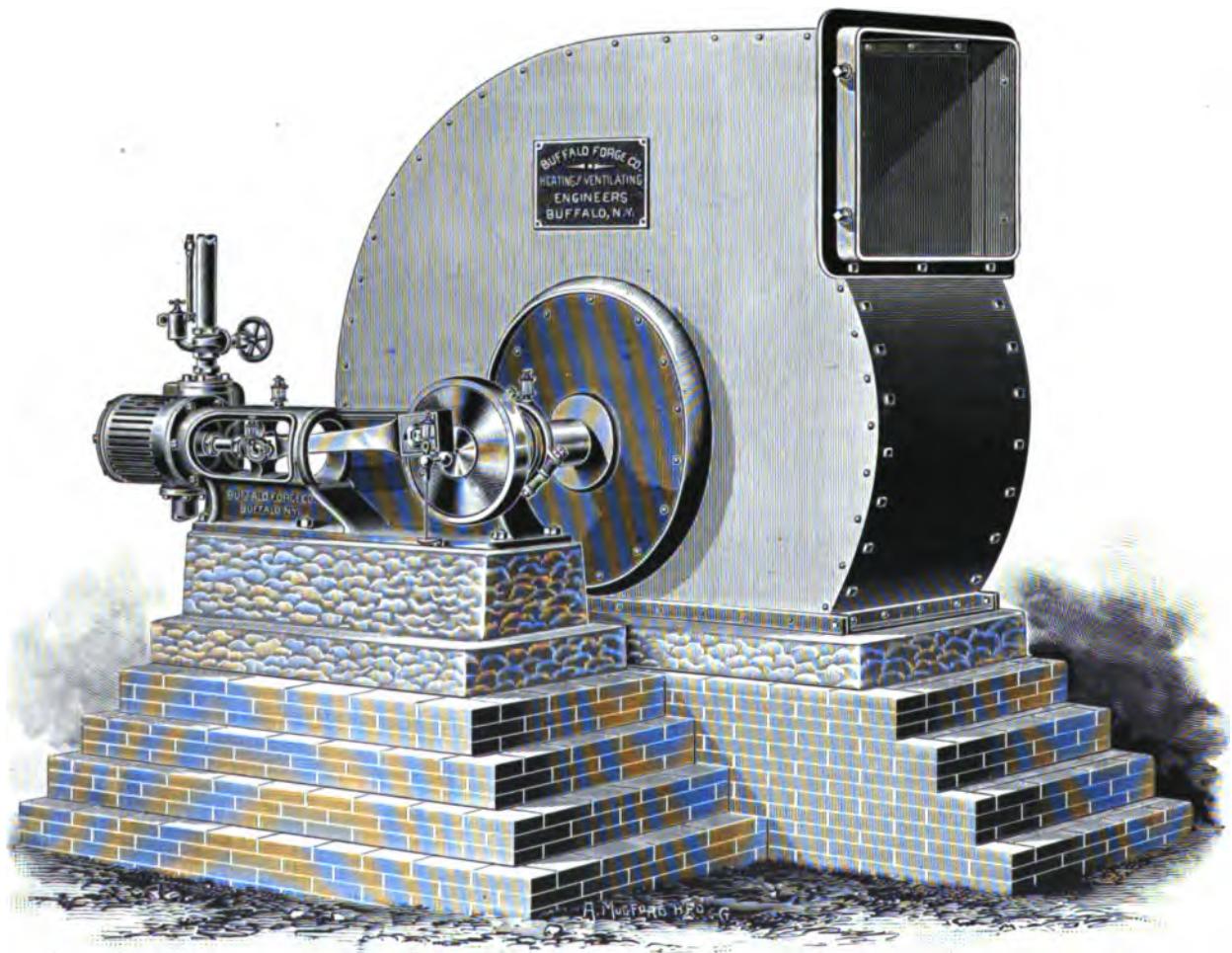
As clearly shown by the engravings on pages 9 and 12, this engine is regularly built both wholly or partially enclosed. The oiling devices are positive and may be supplied to the reciprocating parts in several forms, which are illustrated by the engravings already referred to. The engine frame is rectangular, wider at the base than at the bearings. In the larger sizes, the cylinders are bolted to the base, which forms a part of the housing, and they are so arranged that the piston can readily be removed by withdrawing the bolts of cylinder head and lower end of connecting rod, whereby the crosshead, cylinder head and piston can be lifted out without removing any other part. The steam chest is bolted to the cylinder, that it may be easily removed when desired. The crossheads have Magnolia metal gibbs to prevent cutting of slides, and have clamp joints for the piston rod, which is bored tapered to receive the hardened wrist pin. The pistons are of the snap ring pattern, the rings of which are made of special metal (some having been used for a long time without internal lubrication). The valve is of the piston type, steam being admitted at center instead of at the ends. The rods have large wearing surfaces, crank end is lined with Magnolia metal, and the wrist end has phosphor bronze boxes with wedge adjustment. The crank end adjustment is similar to that of the marine engine; the shaft is of crucible cast steel, the cranks being opposite each other, and the eccentric is cast centrally between. By specially arranged jigs, these cranks and eccentrics are turned, that their relative positions are such as to give the proper position to the valve at various points of the stroke. The eccentric strap is lined with genuine Babbitt, the bearings, which in their ratio are large, are bolted to the main housing, and lined with a special brand of Babbitt metal, also fitted with our improved oiling ring, clearly shown by the detailed engraving on page 23. While every portion is made as compact as possible, yet the arrangement is such as to give ready access to all parts of the engine without disturbing others. The stuffing boxes are provided with nuts which screw on to the glands, and while standard packing is employed, if so ordered and desired, approved metallic packing may be substituted. To prevent corrosion, brass glands are used for the rods; the valve rod is of steel, and fitted with hardened pin and clamp joint. The steam chest head has a phosphor bronze bushing to form a guide for the valve rod. The eccentric rod has means for adjusting valve without removing cover. No rocker or its substitute is used, the object being to reduce the engine details to the fewest possible number—a great desideratum in all high-speed engines. A hand wheel on the shaft, that the engine may be thrown off the center, is provided.

OILING.—Lubrication of Buffalo Double Upright Engine is accomplished in a uniform and positive manner, a result obtained only by the method employed in this and other types of uprights, fully described on page 49, under the head of oiling.

A most thorough investigation of every detail is earnestly requested from those who have occasion to use an engine of this type, and an honest comparison with any existing engine used for the same purposes will substantiate our claim of unequaled construction and design. Particularly prominent features are: A heavy frame with width of base that embodies stability, accessibility for packing and repairs by means of the large dust-proof doors provided, and large surfaces of all parts subject to wear (the shaft of the $6\frac{1}{2} \times 7$ Double Engine being $3\frac{1}{2} \times 10$ inches, the crank pins $2\frac{1}{2} \times 2\frac{1}{2}$ inches, and the crosshead having 24 square inches). Hardened pins are employed wherever possible, and a special composition of metals used for the cylinders and valve, while every wearing part has ready means for adjustment. Simplicity of construction, and highest grade of material and workmanship, upon which depends durability, could not be embodied to greater advantage.

Buffalo Steel Plate Steam Fan,

With Three-quarter Steel Plate Housing.



Fan, Left Hand, Top Horizontal Discharge. Direct Attached
Horizontal Engine.

Buffalo Steel Plate Steam Fans,

Three-quarter Housing Type. Top Horizontal Discharge.

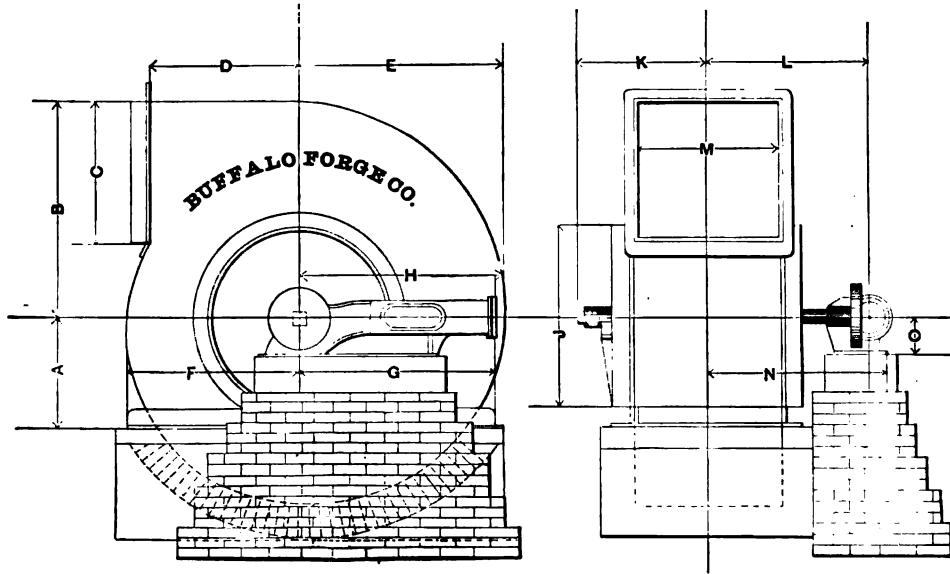


TABLE OF PRINCIPAL DIMENSIONS—IN INCHES.

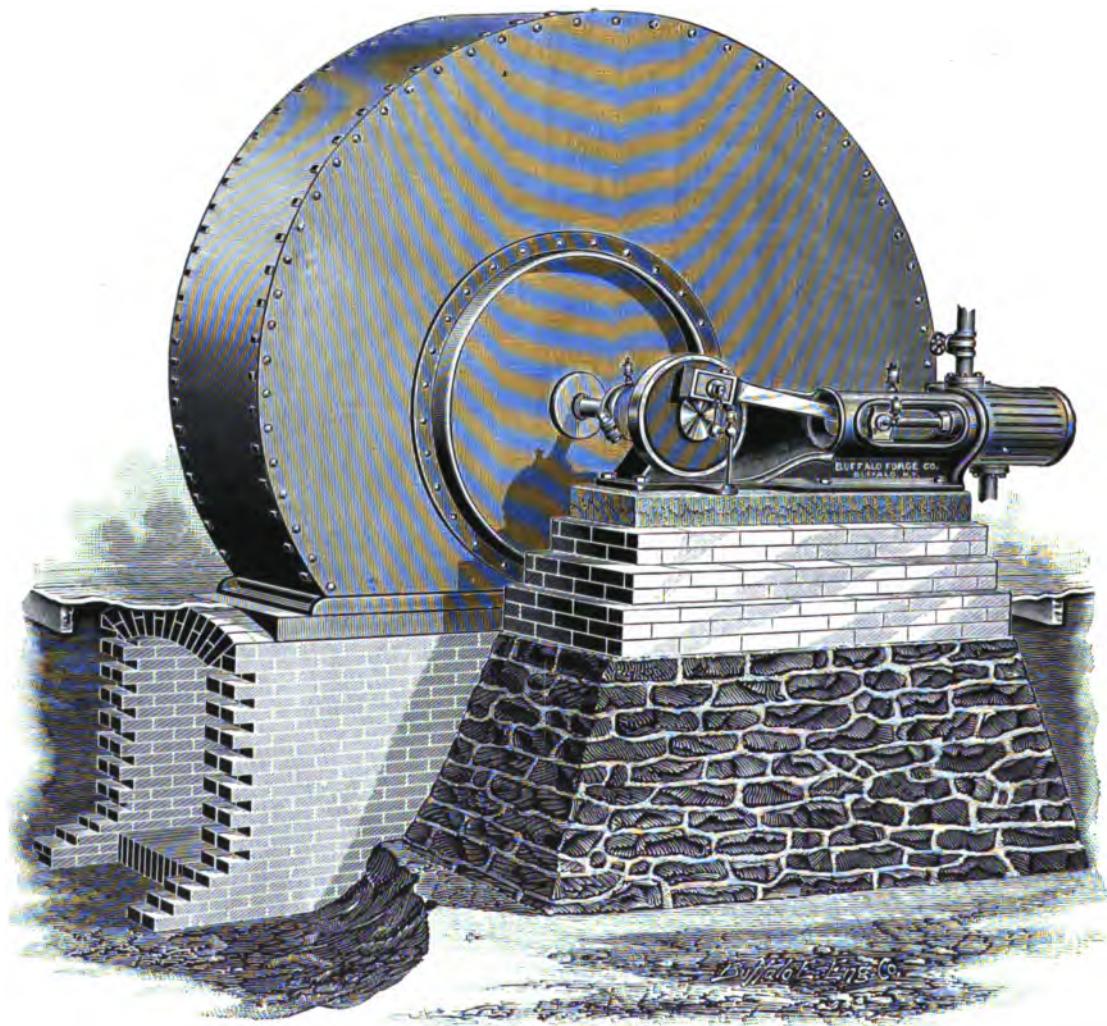
SIZE	A	B	C	D	E	F	G	H	J	K	L	M	N	O	WEIGHT
6 x 8 110 in.	28 $\frac{1}{4}$	56 $\frac{1}{4}$	41	44 $\frac{1}{2}$	53 $\frac{1}{4}$	43	47 $\frac{1}{2}$	48 $\frac{1}{4}$	51 $\frac{1}{2}$	29 $\frac{1}{4}$	41 $\frac{1}{2}$	41	44 $\frac{1}{4}$	8 $\frac{1}{2}$	3920 lbs.
6 $\frac{1}{2}$ x 8 $\frac{1}{2}$ 120 in.	31 $\frac{1}{2}$	61 $\frac{1}{4}$	44 $\frac{1}{4}$	48 $\frac{7}{8}$	58 $\frac{1}{2}$	47	51 $\frac{1}{2}$	48 $\frac{1}{4}$	54 $\frac{1}{2}$	31 $\frac{1}{2}$	43 $\frac{1}{2}$	44 $\frac{1}{4}$	47 $\frac{1}{2}$	8 $\frac{1}{2}$	4625 "
8 x 8 130 in.	34	67	48 $\frac{1}{2}$	52 $\frac{1}{2}$	63 $\frac{1}{2}$	50 $\frac{1}{2}$	55 $\frac{1}{2}$	58	61	33 $\frac{1}{2}$	49 $\frac{1}{2}$	48 $\frac{1}{2}$	51 $\frac{1}{2}$	10 $\frac{1}{2}$	6525 "
10 x 8 140 in.	36 $\frac{1}{2}$	72 $\frac{1}{2}$	52 $\frac{1}{2}$	56 $\frac{1}{2}$	68 $\frac{1}{2}$	55 $\frac{1}{2}$	60 $\frac{1}{2}$	58 $\frac{1}{2}$	64 $\frac{1}{2}$	36 $\frac{1}{2}$	51 $\frac{1}{2}$	52 $\frac{1}{2}$	54	10 $\frac{1}{2}$	7320 "
10 x 12 150 in.	38 $\frac{1}{4}$	77 $\frac{1}{2}$	56	60 $\frac{1}{2}$	73 $\frac{1}{2}$	59	64 $\frac{1}{2}$	78 $\frac{1}{2}$	69 $\frac{1}{2}$	38 $\frac{1}{2}$	55 $\frac{1}{2}$	56	62 $\frac{1}{2}$	12	10130 "
12 x 12 160 in.	41 $\frac{1}{2}$	82 $\frac{1}{2}$	59 $\frac{1}{2}$	64 $\frac{1}{2}$	78 $\frac{1}{2}$	63	68 $\frac{1}{2}$	78 $\frac{1}{2}$	74 $\frac{1}{2}$	41	58 $\frac{1}{2}$	59 $\frac{1}{2}$	64 $\frac{1}{2}$	12	10820 "
12 x 14 170 in.	44	87 $\frac{1}{2}$	63 $\frac{1}{2}$	68 $\frac{1}{2}$	83	66 $\frac{1}{2}$	72 $\frac{1}{2}$	82	79	43 $\frac{1}{2}$	65 $\frac{1}{2}$	63 $\frac{1}{2}$	69 $\frac{1}{2}$	15	12800 "
14 x 14 180 in.	46 $\frac{1}{2}$	92 $\frac{1}{2}$	67 $\frac{1}{2}$	72 $\frac{1}{2}$	87 $\frac{1}{2}$	70 $\frac{1}{2}$	77 $\frac{1}{2}$	83	83 $\frac{1}{2}$	45 $\frac{1}{2}$	67 $\frac{1}{2}$	67 $\frac{1}{2}$	72 $\frac{1}{2}$	15	14700 "

These Steam Fans can be supplied with various sizes Horizontal Engines, according to the steam pressures under which they are to operate, therefore the engine dimensions given above are necessarily variable.

Uniformity of fan proportions and capacities exists throughout all sizes; this is verified by the table above, the tables of capacities (see pages 19 and 29), and, more than all, by the fans themselves. Fans of no other manufacture show a like regulation.

Buffalo Steel Plate Steam Fan,

With Three-quarter Steel Plate Housing.



Fan, Right Hand, Bottom Horizontal Discharge, Direct Attached
Horizontal Engine.

Buffalo Steel Plate Steam Fans,

Three-quarter Housing Type. Bottom Horizontal Discharge.

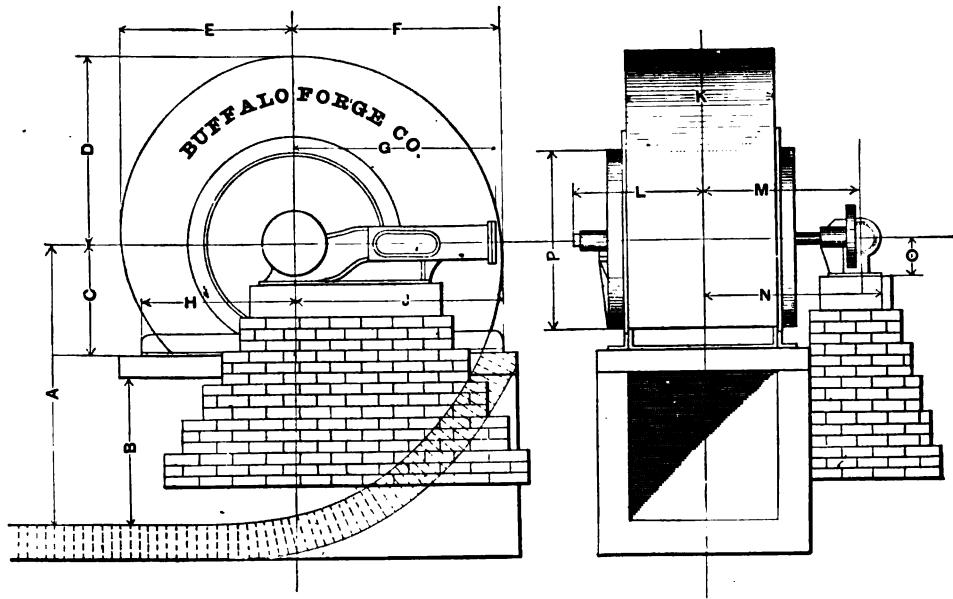


TABLE OF PRINCIPAL DIMENSIONS—IN INCHES.

SIZE	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	WEIGHT
6 x 8 110 in.	72 $\frac{1}{2}$	41	28 $\frac{1}{2}$	50 $\frac{1}{2}$	47 $\frac{1}{2}$	53 $\frac{1}{2}$	48 $\frac{1}{2}$	40	51 $\frac{1}{2}$	41	29 $\frac{1}{2}$	41 $\frac{1}{2}$	44 $\frac{1}{2}$	8 $\frac{1}{2}$	51 $\frac{1}{2}$	3920 lbs
6 $\frac{1}{2}$ x 8 $\frac{1}{2}$ 120 in.	79 $\frac{1}{2}$	44 $\frac{1}{2}$	31 $\frac{1}{2}$	55 $\frac{1}{2}$	52 $\frac{1}{2}$	58 $\frac{1}{2}$	48 $\frac{1}{2}$	43 $\frac{1}{2}$	56	44 $\frac{1}{2}$	31 $\frac{1}{2}$	43 $\frac{1}{2}$	47 $\frac{1}{2}$	8 $\frac{1}{2}$	56 $\frac{1}{2}$	4625 "
8 x 8 130 in.	85 $\frac{1}{2}$	48 $\frac{1}{2}$	34	60	56 $\frac{1}{2}$	63 $\frac{1}{2}$	58	47	60 $\frac{1}{2}$	48 $\frac{1}{2}$	33 $\frac{1}{2}$	49 $\frac{1}{2}$	51 $\frac{1}{2}$	10 $\frac{1}{2}$	61	6525 "
10 x 8 140 in.	91 $\frac{1}{2}$	52 $\frac{1}{2}$	36 $\frac{1}{2}$	64 $\frac{1}{2}$	60 $\frac{1}{2}$	68 $\frac{1}{2}$	58 $\frac{1}{2}$	51 $\frac{1}{2}$	65 $\frac{1}{2}$	52 $\frac{1}{2}$	38 $\frac{1}{2}$	51 $\frac{1}{2}$	54	10 $\frac{1}{2}$	64 $\frac{1}{2}$	7320 "
10 x 12 150 in.	97 $\frac{1}{2}$	56	38 $\frac{1}{2}$	69 $\frac{1}{2}$	65 $\frac{1}{2}$	73 $\frac{1}{2}$	78 $\frac{1}{2}$	54 $\frac{1}{2}$	70 $\frac{1}{2}$	56	38 $\frac{1}{2}$	55 $\frac{1}{2}$	62 $\frac{1}{2}$	12	69 $\frac{1}{2}$	10130 "
12 x 12 160 in.	104 $\frac{1}{2}$	59 $\frac{1}{2}$	41 $\frac{1}{2}$	73 $\frac{1}{2}$	69 $\frac{1}{2}$	78 $\frac{1}{2}$	78 $\frac{1}{2}$	58 $\frac{1}{2}$	74 $\frac{1}{2}$	59 $\frac{1}{2}$	41	58 $\frac{1}{2}$	64 $\frac{1}{2}$	12	74 $\frac{1}{2}$	10820 "
12 x 14 170 in.	110 $\frac{1}{2}$	63 $\frac{1}{2}$	44	78 $\frac{1}{2}$	74	83	82	62	79 $\frac{1}{2}$	63 $\frac{1}{2}$	43 $\frac{1}{2}$	65 $\frac{1}{2}$	69 $\frac{1}{2}$	15	79	12800 "
14 x 14 180 in.	117 $\frac{1}{2}$	67 $\frac{1}{2}$	46 $\frac{1}{2}$	83 $\frac{1}{2}$	78 $\frac{1}{2}$	87 $\frac{1}{2}$	83	65 $\frac{1}{2}$	83 $\frac{1}{2}$	67 $\frac{1}{2}$	45 $\frac{1}{2}$	67 $\frac{1}{2}$	72 $\frac{1}{2}$	15	83 $\frac{1}{2}$	14700 "

These Steam Fans can be supplied with various sizes Horizontal Engines, according to the steam pressures under which they are to operate, therefore the engine dimensions given above are necessarily variable.

Uniformity of fan proportions and capacities exists throughout all sizes; this is verified by the table above, the tables of capacities (see pages 19 and 29), and, more than all, by the fans themselves. Fans of no other manufacture show a like regulation; observe outline cuts on page 41.

Buffalo Steel Plate Steam Fans,

With Three-quarter Steel Plate Housings.

In the majority of applications of large Steel Plate Fans for any service, much can be gained in economy of arrangement and convenience of operation, by building them in the Three-quarter Housing form, and they are furnished in this type for driving by pulley and belt, or with Direct Acting Horizontal Engines.

While they may be readily secured in any of the sizes of Full Housing Fans, it is rare that existing conditions are such as to make it desirable to select a three-quarter type, except in the larger diameters. Buffalo Three-quarter Housing Steam and Pulley Fans are built either right or left hand, and in any of the discharges given for the Full-housing Fans. The more common form of discharges, however, are bottom horizontal, top horizontal and up blast. The first, illustrated by the engraving on page 16, is often the most economical for blowing batteries of boiler fires, also in Buffalo Hot Blast Heating and Ventilating arrangements when the ducts for air distribution are beneath the floor, and of brick or tile. A top horizontal discharge is naturally selected when galvanized iron ducts are run overhead, immediately beneath the basement ceiling from which risers are taken to the various points to be heated. The up blast discharge, alike in Three-quarter and Full Housing Steel Plate Fans, is peculiarly fitted to the one-stand pipe system of hot blast factory heating and ventilating. In any of the above methods of Buffalo Hot Blast Heating and Ventilating, the apparatus will assume the exhaust type, as illustrated on page 56.

These fans are applied for the same variety of purposes as given for Buffalo Steel Plate Steam and Pulley Fans in full housing. Heavy stock for the shells is employed, and rigidly stayed and stiffened. The engines are exactly the same as the regular Buffalo Horizontal Engines, fully described elsewhere. Complete drawings for foundations and applications are furnished with every order.

DOUBLE ARRANGEMENT.- Two Buffalo Three-quarter Housing Steel Plate Fans are often introduced in many buildings in preference to a single fan of equal capacity, and afford superior advantages. Less vertical space is consumed, and as fans when used for heating and ventilating are commonly placed in basements of buildings, the substitution of the double arrangement is often the only method of obtaining the required volume without building a special house for the apparatus, which would materially increase the cost of installation of the system.

For an assemblage of puddling and heating furnaces or boiler fires, or any kind of furnaces employing grate bars, often the most desirable arrangement is to select a Bottom Horizontal Discharge Fan, such as illustrated by the engraving, which readily delivers the air to the fires through an underground duct, without the necessity of making abrupt elbows and turns in blast pipes. We build a line of blowers, in general appearance and dimensions similar to those in the tables for the regular Buffalo Steel Plate Fans, but especially adapted for the various lines of iron and steel manufacture, which require air at a larger volume than can be secured by the largest "B" blowers, and at nearly as great a pressure as these fans are capable of furnishing. To meet the requirements of these conditions, and to equal the high standard of durability and quiet running of all Buffalo Blowers, extra heavy steel plate is selected, with side plates and foundation frames of increased stiffness and rigidity. The shafts, wheels and all other parts are of extra strength, but of the same high grade of construction and form employed for the regular fans, so clearly referred to in the accompanying pages.

In ordering Three-quarter Housing Steel Plate Fans full details of the requirements should be given, together with dimensions of space allotted for the fan and its location.

Buffalo Steel Plate Pulley Fans,

Three-quarter Housing Type. Top Horizontal Discharge.

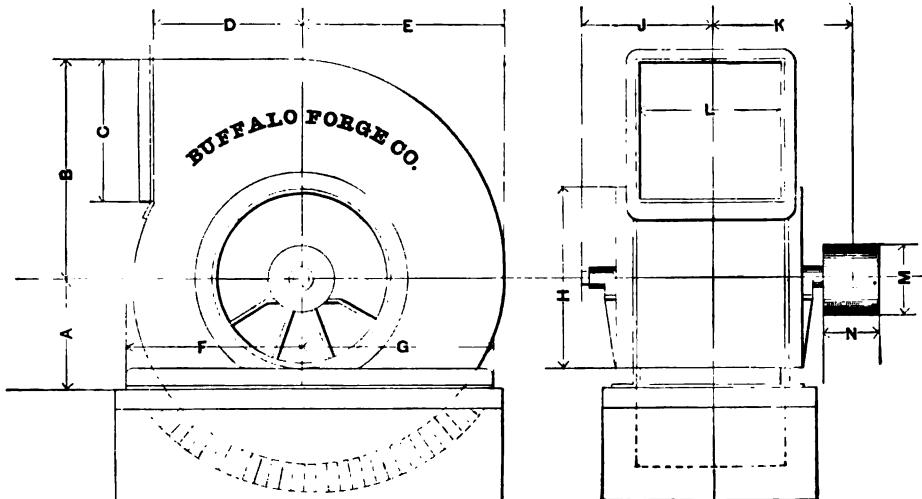


TABLE OF PRINCIPAL DIMENSIONS—IN INCHES.

SIZE	A	B	C	D	E	F	G	H	J	K	L	M	N	WEIGHT
110 in.	28 $\frac{1}{2}$	56 $\frac{1}{2}$	41	44 $\frac{1}{2}$	53 $\frac{1}{2}$	43	47 $\frac{1}{2}$	51 $\frac{1}{2}$	29 $\frac{1}{2}$	31 $\frac{1}{2}$	41	18	13	3200 lbs.
120 "	31 $\frac{1}{2}$	61 $\frac{1}{2}$	44 $\frac{1}{2}$	48 $\frac{1}{2}$	58 $\frac{1}{2}$	47	51 $\frac{1}{2}$	54 $\frac{1}{2}$	31 $\frac{1}{2}$	34	44 $\frac{1}{2}$	20	14	4000 "
130 "	34	67	48 $\frac{1}{2}$	52 $\frac{1}{2}$	63 $\frac{1}{2}$	50 $\frac{1}{2}$	55 $\frac{1}{2}$	61	33 $\frac{1}{2}$	36 $\frac{1}{2}$	48 $\frac{1}{2}$	22	15	5300 "
140 "	36 $\frac{1}{2}$	72 $\frac{1}{2}$	52 $\frac{1}{2}$	56 $\frac{1}{2}$	68 $\frac{1}{2}$	55 $\frac{1}{2}$	60 $\frac{1}{2}$	64 $\frac{1}{2}$	36 $\frac{1}{2}$	39 $\frac{1}{2}$	52 $\frac{1}{2}$	24	16	7000 "
150 "	38 $\frac{1}{2}$	77 $\frac{1}{2}$	56	60 $\frac{1}{2}$	73 $\frac{1}{2}$	59	64 $\frac{1}{2}$	69 $\frac{1}{2}$	38 $\frac{1}{2}$	42 $\frac{1}{2}$	56	26	17	8100 "
160 "	41 $\frac{1}{2}$	82 $\frac{1}{2}$	59 $\frac{1}{2}$	64 $\frac{1}{2}$	78 $\frac{1}{2}$	63	68 $\frac{1}{2}$	74 $\frac{1}{2}$	41	45 $\frac{1}{2}$	59 $\frac{1}{2}$	28	18	9320 "
170 "	44	87 $\frac{1}{2}$	63 $\frac{1}{2}$	68 $\frac{1}{2}$	83	66 $\frac{1}{2}$	72 $\frac{1}{2}$	79	43 $\frac{1}{2}$	47 $\frac{1}{2}$	63 $\frac{1}{2}$	30	19	10300 "
180 "	46 $\frac{1}{2}$	92 $\frac{1}{2}$	67 $\frac{1}{2}$	72 $\frac{1}{2}$	87 $\frac{1}{2}$	70 $\frac{1}{2}$	77 $\frac{1}{2}$	83 $\frac{1}{2}$	45 $\frac{1}{2}$	50 $\frac{1}{2}$	67 $\frac{1}{2}$	32	20	11700 "

Buffalo Steel Plate Three-quarter Housing Fans.

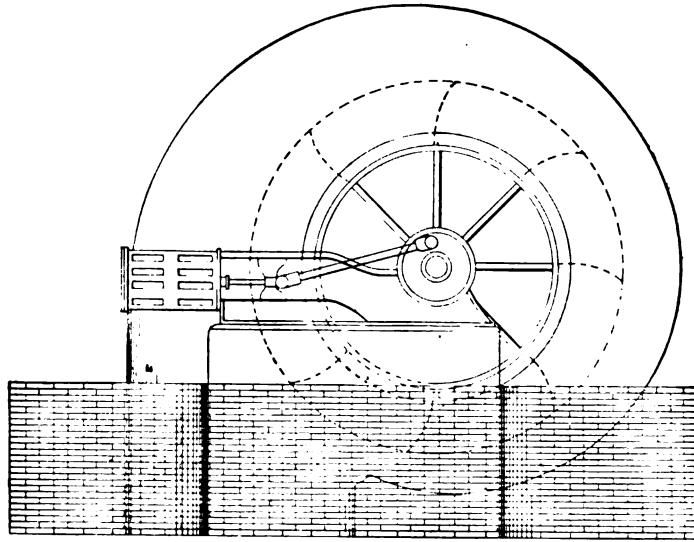
Capacities in Cubic Feet per Minute.

SIZE	REVOLUTIONS PER MINUTE							
	80	100	150	200	250	300	350	400
110 in.	15160	18960	28440	37920	47400	56880	66360	75840
120 "	19840	24800	37200	49600	62000	74400	86800	
130 "	24960	31200	46800	62400	78000			
140 "	30680	38354	57531	76708	95885			
150 "	39400	49260	73890	98520				
160 "	47648	59560	89340	119120				
170 "	57280	71600	107400					
180 "	68144	82680	124020					

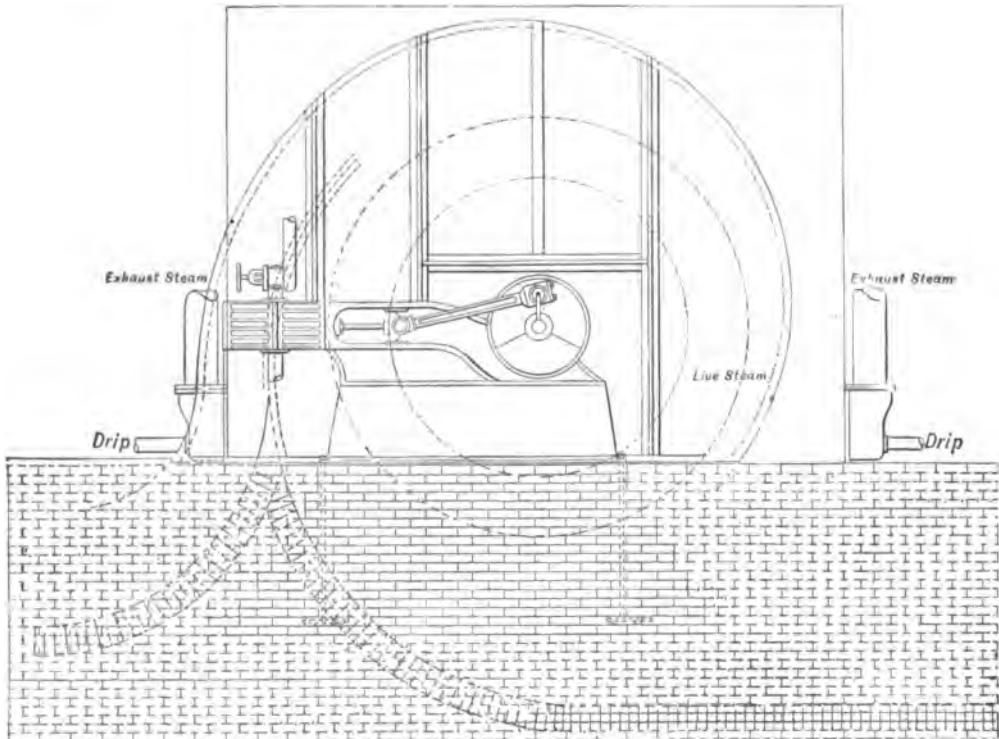
Uniformity of fan proportions and capacities exists throughout all sizes; this is verified by the tables above, the tables of capacities (see also page 29), and, more than all, by the fans themselves. Fans of no other manufacture show a like regulation; observe outline cuts on page 41.

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Buffalo Steel Plate Steam Fans.



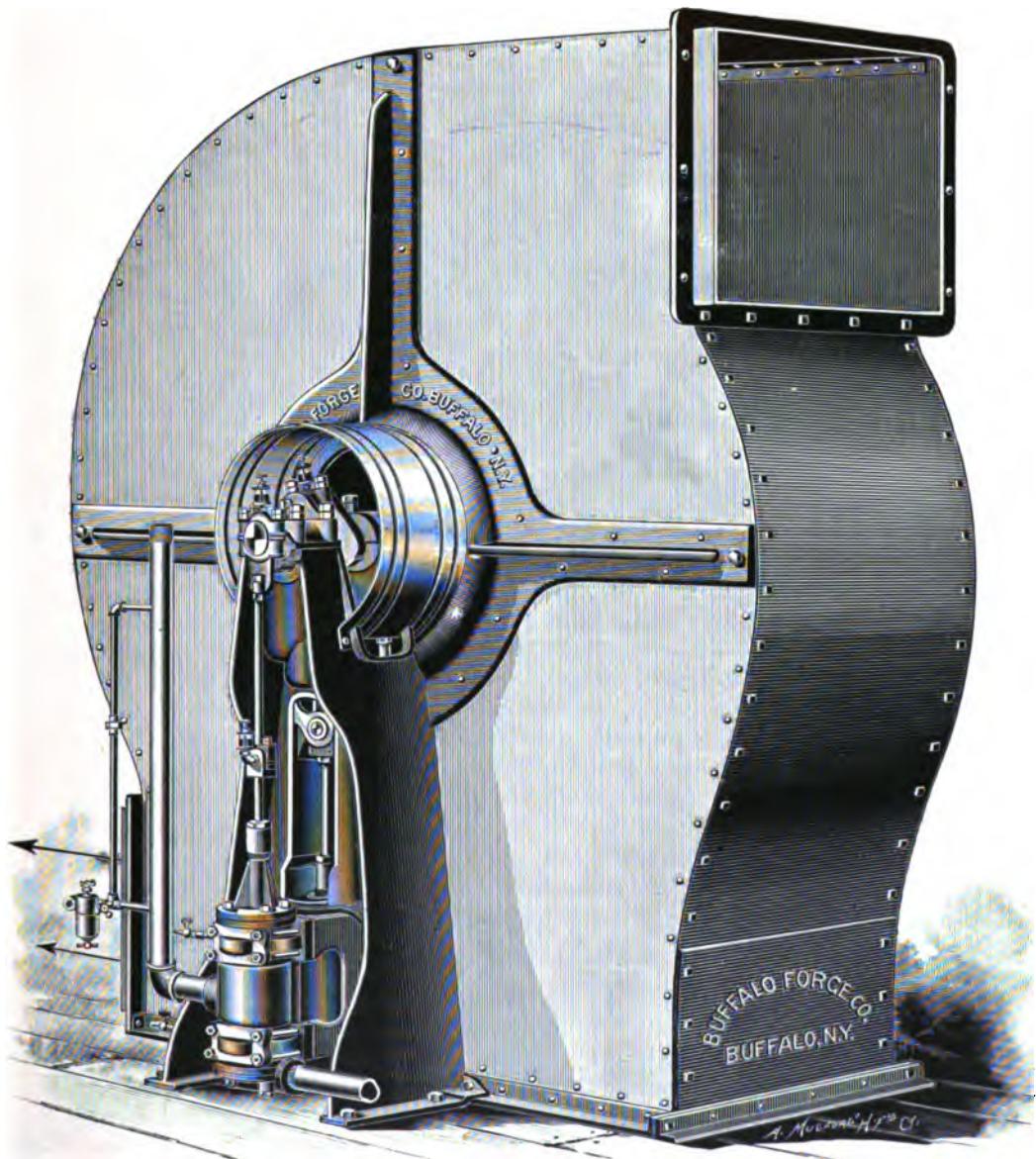
Three-quarter Housing Fan, Down Blast, Right Hand, Horizontal Engine.



Three-quarter Steel Plate Housing Steam Fan, with Double Discharge,
Direct Attached Horizontal Engine.

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Buffalo Special Steel Plate Steam Fan.



Top and Bottom Horizontal Discharge, Self-contained Upright Engine, Both Bearings
on Engine Side, Fan Wheel Overhung.

Buffalo Special Steel Plate Steam Fans.

APPLICATIONS.—Attention has previously been called by the engravings and descriptions to the adaptation of Buffalo Steel Plate Steam Fans of special construction for ventilation and forced draft upon steamboats. These machines are equally well suited for any work of this nature where continuous and high speed is required, and particularly for supplying draft to batteries of boilers in Electric Light Stations, Power Plants, etc., where, at the same time, they may often be arranged for cooling the engine and boiler rooms, and thus serve a double purpose to great advantage. For very large bagasse furnaces, requiring greater fan capacity than is secured in the "B" type, these fans are adapted with eminently successful results.

The Double Enclosed Engine for continuous operation affords advantages not reached in any other type, and naturally stands without a rival for location where dust is present in the atmosphere. The special design illustrated and described on previous pages has found great favor with our customers, and has not only been adopted for innumerable situations of the nature referred to, but is often selected for driving the fans used with Buffalo Hot Blast Lumber Dry Kiln Apparatus, where a constant and easy running arrangement is imperative, incident to such kilns as are run to their fullest capacity without cessation.

ADVANTAGES OF DOUBLE DISCHARGES.—Especially where used in conjunction with the Buffalo Hot Blast Heating Apparatus, and where the location of the outfit is at a central point in relation to the space to be heated, a fan of double discharge oftentimes is of great convenience, in some instances being the only manner in which the application could be made. Built as shown by the engraving on page 21, and used in connection with a coil heater, the fan would handle the air hot, drawing it over the coils, and deliver an equal portion through each outlet, from whence it would be conveyed to the various distributing flues.

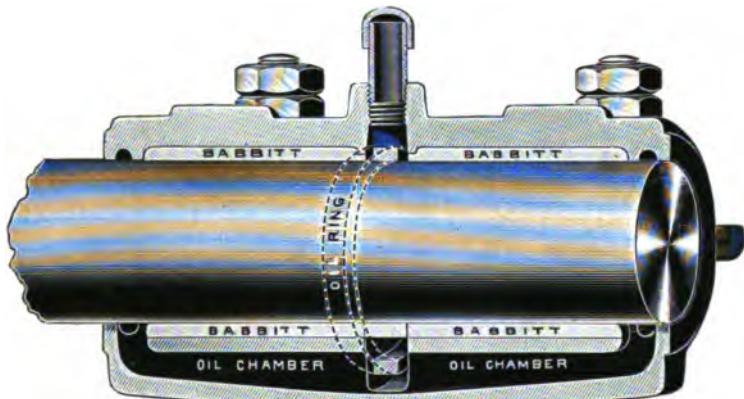
These Special Steam Fans are constructed to discharge in any given angles, and can readily be furnished with a reasonable number of outlets. As may be seen by the cut, the air created by that fan is discharged horizontally at the top and bottom; a form for delivering air vertically top and bottom may be as readily secured. In heating work, the latter style makes it possible, if desired on account of no better position being available, to locate the apparatus, in a building containing a number of floors, upon the central one, while the heated air is conveyed to the upper and lower stories through the medium of the two outlets and hot air pipes connecting thereto.

The greatest economy in power and saving in piping can often be secured by employing a fan of special discharge, such as shown by the various engravings. In ordering or asking for estimates, detailed descriptions of the results to be secured should be given, and these be embodied in a sketch, if possible.

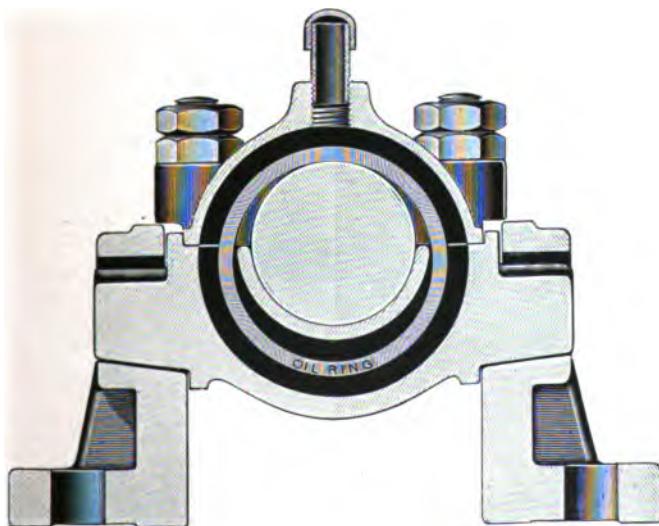
THE BUFFALO PATENTED OIL RING BEARINGS.—On all Buffalo Steel Plate Steam and Pulley Fans, this form of journal bearing is employed. The component parts and construction are so clearly portrayed in the engraving appearing on the opposite page that a description is unnecessary. As will readily be appreciated, a more positive or perfect bearing for rapidly rotating parts does not exist. This device is entirely automatic in action, the oil being constantly carried around the shaft by the ring, as will be seen by reference to the cut; it is thus impossible for the bearings to be without lubrication while there is oil in the chamber. The dimensions of the latter are ample, and the oil is not wasted. The ring operates perfectly quiet until the oil becomes low; when any noise is heard it may be taken as a signal for re-filling. The bearings, however, will run without injury for quite a time after the signal for re-filling is noticed. The re-filling of the oiling device is not required oftener than once a week even in continuous high speeds. Upon the point of requiring practically no attention, this improved bearing possesses merit unequaled by any oiling arrangement yet offered.

Buffalo Patented Self-oiling Journal Bearing,

Used on all Steel Plate Pulley and Engine Fans.



Sectional View of Oil Ring Bearing.

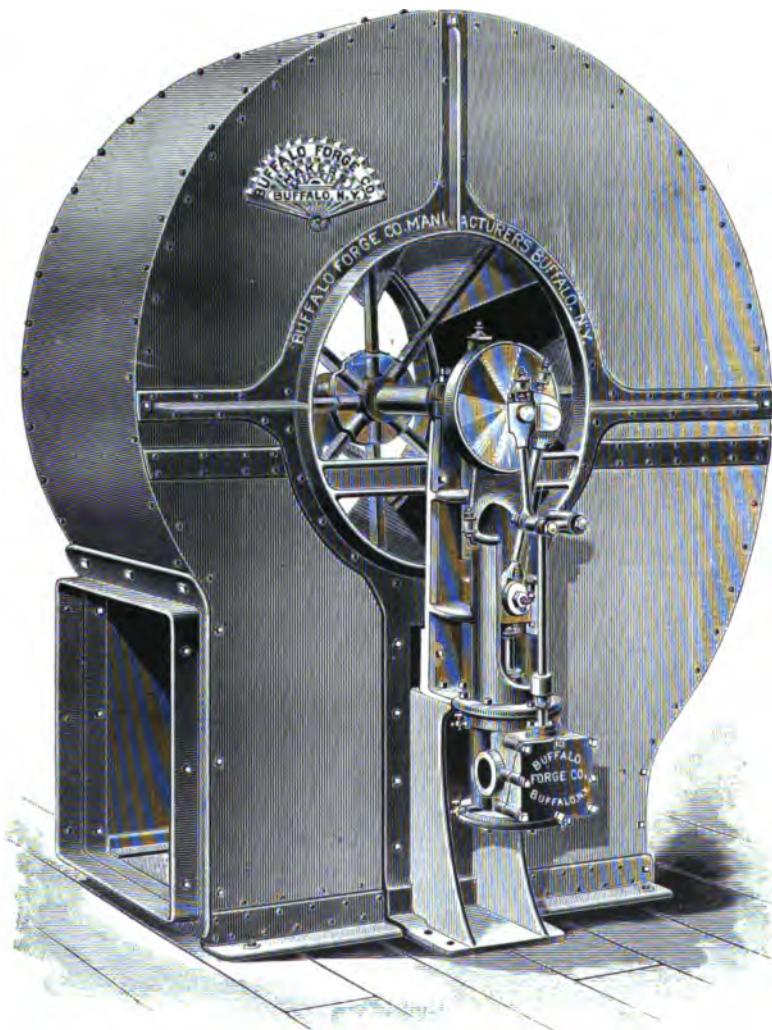


End View of Oil Ring Bearing.



The Bearing Bracket.

Buffalo Steel Plate Steam Fan.



Single Vertical Engine, attached direct to Fan Shaft. Right Hand, Bottom
Horizontal Discharge Blower, with Two Inlets.

Buffalo Steel Plate Steam Fans.

AS these machines are built to operate both as blowers and exhausters, together with Single Vertical, Double Vertical, and Single Horizontal and Double Horizontal Engines, adapted for all conditions, the uses for which they are employed are almost unlimited in number. In connection with the Buffalo Steam Hot Blast Apparatus, they have been introduced in thousands of buildings with pre-eminent success.

It will readily be seen that they possess marked advantages over belt-driven fans, inasmuch as they may be run at any time, and at any speed, independent of other power; the volume and pressure of air can be changed instantly, and belts and pulleys avoided. Under many conditions of application, the use of Pulley Fans would involve intricate arrangements in the transmission of power to the fan which are entirely eliminated by the use of a Direct Acting Engine.

For heating and ventilating systems, when used in connection with Buffalo Steam Hot Blast Heaters, or when used separately for ventilation alone, these fans are usually employed with Single Vertical or Horizontal Engines. For Full Housing Fans, unless steam is to be carried at a very low pressure, the Single Vertical type of engine is usually chosen, as being the most convenient of operation. For heating work, where the system is practically a low pressure one, an engine with larger cylinder is required to drive a given size of fan than under the use of high pressure steam. Especially in the case of Hot Blast Heating Plants for public buildings, a Low Pressure Apparatus is desirable, and for such a situation we usually recommend the selection of a Horizontal Steam Engine for driving the fan. Very large fans are usually built in the three-quarter housing type (see pages 14 to 20), and as the fan shaft is then brought closely to the floor line, it will at once be seen that the horizontal type of engine is the only one which would be practicable to use.

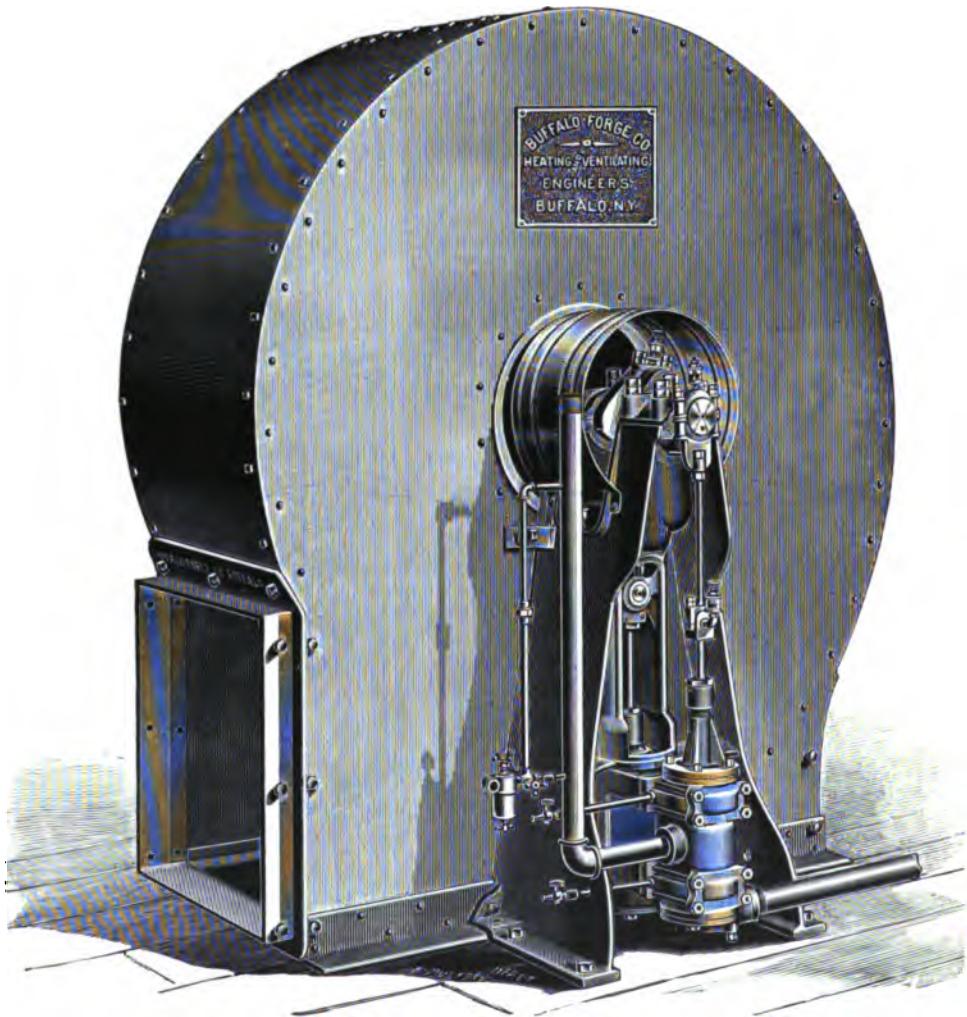
Our line of upright engines, both in the single and double types, consists of a large number of sizes, so that Full Housing Fans, even in the largest sizes, may be furnished therewith where so desired.

These fans are especially fitted for moving vitiated air, gases, smoke or dust from any room or a series of apartments; for blowing fresh cold air into given spaces through properly proportioned flues or ducts; for maintaining a cool temperature in over-heated workrooms, such as found in rolling mills, foundry, boiler rooms and various kindred industries; for blowing puddling, boiler or heating furnace fires. In cold storage warehouses, malt houses, breweries, etc., these fans have been found indispensable. For any purpose where a large volume of air is to be handled with a minimum expenditure of power, they are unequaled by any other type of fan.

The cut appearing on the opposite page clearly shows the Buffalo Steam Fan with Upright Engine, which we have built for a series of years; the average running record of the Steam Fans of the type illustrated by the engraving, placed during this period, makes it evident that simplicity of design, excellent workmanship and material, together with systematic construction, have been combined to advantage.

In ordering a Steam Fan, always be sure to state whether right or left hand, and what style of discharge is wanted, the pressure carried at the boilers, and what work it is intended to perform. A drawing showing the proposed setting position of the fan, and all other details, will greatly facilitate the selection of the proper machine for the work; send too much data, rather than too little.

Buffalo Steel Plate Steam Fan.



Right Hand, Bottom Horizontal Discharge Exhauster, Self-contained Upright Engine,
Both Bearings on Engine Side, Fan Wheel Overhung.

Buffalo Steel Plate Steam Fans.

In the regular form of construction, Buffalo Steel Plate Steam Fans are built only as exhausters, or with one inlet, this being located at the side directly opposite the engine. A Steel Plate Blower has two inlets, therefore the area of the one inlet of an exhauster is sufficiently enlarged to compensate for the fan having but one source of air supply, and to enable it to derive therefrom the full amount it is capable of handling. The entire suction of air to the fan being taken through the one inlet, we thus avoid the drawing of dust and dirt across the engine, which with two inlets would get into its working parts. Where necessity demands, however, these Steam Fans can readily be built as blowers with two inlets.

The engraving appearing on the foregoing page illustrates the latest development in Upright Engine Fans, and this design embodies all the desirable features that a long experience with this class of machines has demonstrated are indispensable. The engine is self-contained, both bearings of the fan being upon the engine side. Excepting with the larger fans, beginning with 110-inch size and upwards, which are more frequently built in the three-quarter housing type, and run by a horizontal engine, the fan wheels are overhung, and no bearing at the inlet side is required. The design and proportion of the frame are such as to give the greatest rigidity and width of foundation of base, so that all the working strains are in a straight or central line. Perfect alignment is ensured, and defective foundations, caused by bad workmanship or settling, do not readily affect the smooth running of the fan. The valve is of the piston type, and the general features and construction of this engine are identically the same as of the Buffalo Independent Self-contained Vertical Engine, described in detail on page 49.

Throughout the entire sizes of engines for the various fans, the parts are interchangeable, so that in the event of repairs ever being required, any detail may at once be supplied. Special attention is directed to the unique and unsurpassed method of oiling the bearings and reciprocating parts of the engine, as embodied in the general description of the Buffalo Self-contained Upright Engine.

All sizes of Buffalo Steel Plate Steam Fans with Upright Engines are uniformly furnished either right or left hand, to discharge either top horizontal, bottom horizontal, up blast or down blast; they may be built to order to deliver air in any other direction, or with two or more discharges, several of the various forms which may readily be furnished being indicated by the outline cuts on accompanying pages.

Where these fans are to be placed in existing buildings, accessible only by narrow or limited passageways, they can be so arranged that the upper portion of the casing may be easily removed or they can be taken entirely apart and erected after arrival. This point should be referred to in ordering, together with the hand and style of discharge wanted.

BUFFALO STEAM FAN, CYLINDER ABOVE THE SHAFT. (See page 28.)—The smallest steam fans, viz., below 70 inches in height, are oftentimes used in such positions that an engine with cylinder above the shaft is much more convenient of operation than the regular Buffalo Upright Engine Fan, and, therefore, when requested, are furnished in the latter form. Unless especially requested, the 70-inch Steam Fans are always furnished with engines below the shaft. In this type of steam fan, the cylinder and frame are one casting, the base of which is wide and ribbed to give ample stability. To facilitate repairs, the bearing on one side is bolted to frame, so that the crank can be readily removed. The crank revolves in oil when so desired, as a trough is formed in base for that purpose. Where this feature is undesirable, the leakage from piston stuffing boxes can be readily removed through the drip pipe. The frame is bolted to a rigid base to prevent vibration when running at high speeds. A hand wheel is provided to throw the engine off the center. The bearings have our patented self-oiling rings; all the details of the engine have the same quality of material and workmanship as the regular Buffalo Upright Self-contained Engine.

Buffalo Steel Plate Steam Fan,

Cylinder Above the Shaft.



Left Hand, Bottom Horizontal Discharge Exhauster, Self-contained Upright Engine,
Cylinder above the Shaft, Both Bearings on Engine Side, Fan Wheel Overhung.

Buffalo Steel Plate Full Housing Fans,

Capacities in Cubic Feet of Air per Minute.

SIZE	REVOLUTIONS PER MINUTE										
	100	150	200	250	300	350	400	450	500	550	600
50 in.	1650	2475	3300	4125	4950	5775	6600	7425	8250	9075	9900
60 "	2480	3720	4960	6200	7440	8680	9920	11160	12400	13640	14880
70 "	4500	6750	9000	11250	13500	15750	18000	20250	22500		
80 "	7070	10605	14140	17675	21210	24745	28280	31815			
90 "	10400	15600	20800	26000	31200	36400	41600				
100 "	14280	21420	28560	35700	42840	49980	57120				
110 "	18960	28440	37920	47400	56880	66360					
120 "	24800	37200	49600	62000	74400						
130 "	31200	46800	62400	78000	109200						
140 "	38354	57581	76708	95885							
150 "	49260	73890	98520	123150							

Buffalo Full and Three-quarter Housing Fans,

Capacities at Different Velocities and Pressures.

SIZE	VELOCITIES IN CUBIC FEET PER MINUTE; PRESSURES IN OUNCES AT FAN OUTLETS											
	2544 FEET PER MINUTE $\frac{1}{4}$ OUNCE			3654 FEET PER MINUTE $\frac{1}{2}$ OUNCE			4482 FEET PER MINUTE $\frac{3}{4}$ OUNCE			5175 FEET PER MINUTE 1 OUNCE		
	Capacity	Revolutions per Minute	Capacity	Revolutions per Minute	Capacity	Revolutions per Minute	Capacity	Revolutions per Minute	Capacity	Revolutions per Minute	Capacity	Revolutions per Minute
50 in.	5720	346	8140	492	9900	600	11440	600	11440	600	11440	693
60 "	8060	325	11470	462	13950	562	16120	562	16120	562	16120	650
70 "	11440	254	16280	381	19800	441	22880	441	22880	441	22880	509
80 "	15080	213	21460	303	26100	369	30160	369	30160	369	30160	426
90 "	19500	187	27750	266	33750	325	39000	325	39000	325	39000	376
100 "	24180	170	34410	242	41850	294	48360	294	48360	294	48360	340
110 "	29120	153	41540	217	50400	265	58240	265	58240	265	58240	307
120 "	34840	140	49580	195	60300	243	69680	243	69680	243	69680	280
130 "	41080	131	58460	187	71100	227	82160	227	82160	227	82160	263
140 "	47580	124	67710	172	82350	214	95160	214	95160	214	95160	248
150 "	54600	110	77700	161	94500	196	109200	196	109200	196	109200	227
160 "	62400	104	88800	149	108000	181	124800	181	124800	181	124800	209
170 "	70460	98	100270	140	121950	171	140920	171	140920	171	140920	197
180 "	79040	95	112480	136	136800	165	158080	165	158080	165	158080	191

Uniformity of proportions and capacities exists throughout all sizes of Buffalo Steel Plate Steam and Pulley Fans, in both the Full and Three-quarter Housing types. This is verified by the above tables, the various tables of dimensions, and, more than all, by the fans themselves. Fans of no other manufacture show a like regulation; observe outline cuts on page 41.

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Buffalo Steel Plate Steam Fans,

Upright Self-contained Engine. Bottom Horizontal Discharge.

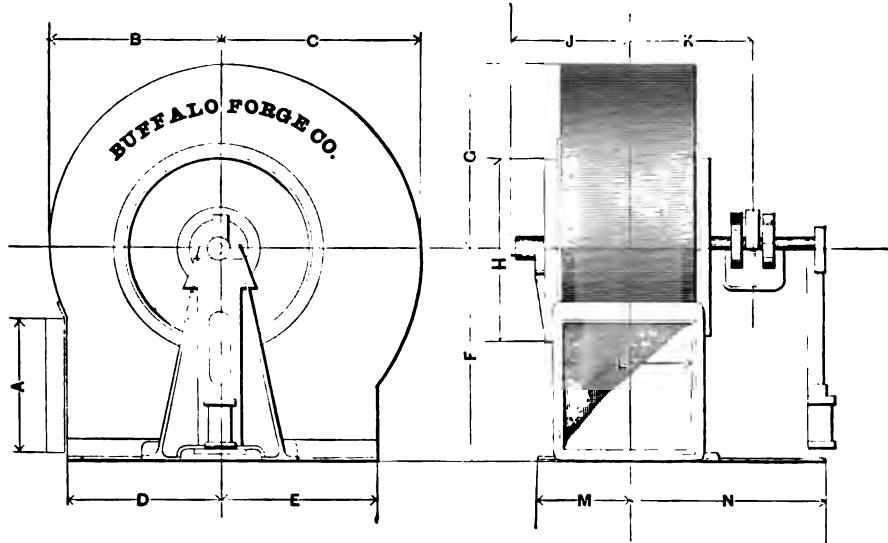


TABLE OF PRINCIPAL DIMENSIONS—IN INCHES.

SIZE	A	B	C	D	E	F	G	H	J	K	L	M	N	WEIGHT
3½ x 5 50 in.	18½	21½	24½	20	20	27	23	24½	15½	16½	18½	11½	22½	1025 lbs.
4 x 5 60 in.	22½	25½	29½	24½	24½	32½	27½	26½	17½	18	22½	13½	24½	1254 "
4½ x 7 70 in.	26	30½	34½	28½	28½	37½	32½	34½	19½	20½	26	15½	29½	1760 "
5½ x 7 80 in.	29½	34½	39½	32½	32½	43½	36½	39½	21½	22½	29½	17	31½	2206 "
6 x 8 90 in.	33½	39	44	36½	36½	48½	41½	43	24½	24½	33½	18½	36½	2830 "
6½ x 8 100 in.	37½	43½	48½	40½	40½	53½	46½	45½	25½	26½	37½	21½	38½	3370 "
6½ x 9 110 in.	41	47½	53½	44½	44½	59½	50½	51½	29	28½	41	23½	40½	4325 "
7 x 9 120 in.	44½	52½	58½	48½	48½	64½	55½	54½	31½	31½	44½	25½	43½	5260 "
7½ x 9 130 in.	48½	56½	63½	52½	52½	70	60	61	33½	33½	48½	27½	45½	6700 "

All above fans are furnished with Buffalo Self-contained Upright Engines, and the fan wheels are overhung, excepting in the last three sizes. The wood engraving on page 26 illustrates these Steam Fans fully.

Fifty-inch, sixty-inch and seventy-inch fans may be furnished with engines having the cylinder above the shaft, as illustrated on page 28. In this case, the engine dimensions above will not apply, but will be furnished on application. Uniformity of fan proportions and capacities exists throughout all sizes; this is verified by the table above, the tables of capacities (see pages 19 and 29), and, more than all, by the fans themselves. Fans of no other manufacture show a like regulation; observe cuts on page 41.

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Buffalo Steel Plate Steam Fans,

Upright Self-contained Engines. Top Horizontal Discharge.

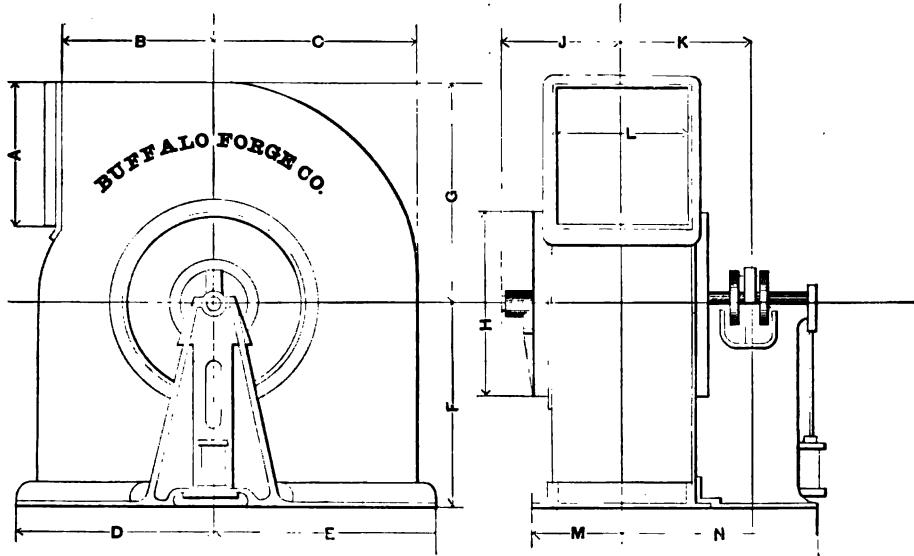


TABLE OF PRINCIPAL DIMENSIONS—IN INCHES.

SIZE	A	B	C	D	E	F	G	H	J	K	L	M	N	WEIGHT
3½ x 5 50 in.	18½	20	24½	23½	26½	23½	26	24½	15½	16½	18½	11½	22½	1025 lbs.
4 x 5 60 in.	22½	24½	29½	27½	31½	28	31½	26½	17½	18	22½	13½	24½	1254 "
4½ x 7 70 in.	26	28½	34½	32½	36½	37½	36½	34½	19½	20½	26	15½	29½	1763 "
5½ x 7 80 in.	29½	32½	39½	36½	41½	37½	41½	39½	21½	22½	29½	17	31½	2206 "
6 x 8 90 in.	33½	36½	44	41	46	44	46½	43	24½	24½	33½	18½	36½	2830 "
6½ x 8 100 in.	37½	40½	48½	45½	51½	47	51½	45½	25½	26½	37½	21½	38½	3370 "
6½ x 9 110 in.	41	44½	53½	50½	56½	51	56½	51½	29	28½	41	23½	40½	4323 "
7 x 9 120 in.	44½	48½	58½	55½	61½	56	61½	54½	31½	31½	44½	25½	43½	5260 "
7½ x 9 130 in.	48½	52½	63½	59½	66½	61	67	61	33½	33½	48½	27½	45½	6700 "

All above fans are furnished with Buffalo Self-contained Upright Engines, and the fan wheels are overhung, excepting in the last three sizes. The wood engraving on page 26 illustrates these Steam Fans fully.

Fifty-inch, sixty-inch and seventy-inch fans may be furnished with engines having the cylinder above the shaft, as illustrated on page 28. In this case, the engine dimensions above will not apply, but will be furnished on application. Uniformity of fan proportions and capacities exists throughout all sizes; this is verified by the table above, the tables of capacities (see pages 19 and 29), and, more than all, by the fans themselves. Fans of no other manufacture show a like regulation; observe cuts on page 41.

Buffalo Steel Plate Blowers and Exhausters,

With Overhung Pulleys.

WHILE the cuts which appear on pages 34 and 35 illustrate a Buffalo Steel Plate Blower, as engraved from photographs of both sides of the machine, these fans are as often built as exhausters. The difference between a Blower and an Exhauster lies in the former having two inlets, while the latter has but one. This is proportionately enlarged in area over the size of one of the inlets in a Blower, and is opposite the pulley side.

The Steel Plate Volume Fans are primarily designed to deliver a maximum amount of air with a minimum expenditure of power. Upon the design of scroll of the housing, and the relative proportion of the blast wheel, together with its form, depends, not only the amount of air per horse-power a Steel Plate Fan is capable of delivering, but its quietness of operation. Inlets and outlets of a fan play a most important part in the question of economy of power. It will readily be seen, therefore, that it is a matter of vital importance that these details be perfect in proportion, in order to embody all requisite features of a thoroughly efficient fan. Whenever the inlets or outlets of a fan are misproportioned, much of the power applied is wasted.

The standard of proportions of Buffalo Steel Plate Fans has been adopted as the outcome of a series of experiments extending over a number of years, with machines in actual use. The results secured warrant the assertion that better proportions do not exist in any other make of fan. It is evident, from the work performed and power consumed by all other fans upon the market, that such exhaustive experiments and tests with component parts of different proportions have never before been so systematically conducted, or else the data secured does not govern the building proportions in vogue.

In every size of Buffalo Steel Plate Fans, correct records of the indicated and actual power consumed under all speeds and variations of atmospheric conditions are preserved, and the proper proportions of each component part have been brought down to the finest point. Every fan is thoroughly tested before leaving our works, and found to equal the best results ever secured from an equal size at any previous time, both as to power consumed and smooth and quiet running.

The Buffalo Steel Plate Fans are built of homogeneous patent leveled and rolled steel sheets, free from buckles, and of the greatest stiffness. The portions of the shell are riveted to angle iron and bolted together. Scrutiny of the several illustrations of Steam and Pulley Fans appearing throughout the catalogue will result in a clear idea of the forms adopted for rigidly staying the fan cases so that they will run without vibration in the different sizes and designs for various work. Base angle iron foundation frames are supplied, all portions being strongly braced. The inlet rings are of cast iron, to which the bearing brackets are bolted. The bearings are swiveled to prevent springing of the shaft when the machine is bolted to a defective foundation; they are equipped with same oiling devices as illustrated on page 23, have large wearing surfaces, and are well lined with a special brand of Babbitt metal. The shafts are of cold rolled steel, of large diameter. The fan wheels are of the same material and workmanship as the celebrated Buffalo Steel Pressure Blower Blast Wheels, though the design for the Steel Plate Fan and Wheel is of the general form illustrated on page 40. By new and improved methods, we are enabled to manufacture these fans in a degree of accuracy and efficiency never before attained in this class of machines.

These fans are regularly built both right or left hand, and to deliver air in any of the following forms: Bottom horizontal, top horizontal, up blast, and down blast. They may be readily furnished in all sizes to discharge in any one or two angles to suit all conditions of application.

Buffalo Steel Plate Pulley Blowers and Exhausters.

THERE is great economy of power in moving a stated volume of air at a low velocity by a large fan, as compared with the movement of the same quantity at a higher pressure by a smaller fan. A number of uses to which blowers are now applied with marked success require a large quantity of air at an average pressure. Heretofore, for large plants the custom has frequently been to use for such service several Buffalo "B" Volume Blowers of sufficient combined capacity, where the largest size was not ample for the work. To accomplish the same work with one blower, we build a line of Special Steel Plate Fans. The dimensions and proportions of the fans are so varied as to fit them to a nicety for a given service. Where a heavy pressure of blast is called for, the fans are built with a much narrower wheel than regular, but with proportionately larger diameter; almost any desired pressure of air may be readily secured by the special construction. The item of power is reduced to a minimum by correct proportions, as a greater volume of air than is actually required is not furnished, while the desired pressure is still maintained. If a regular fan were employed and driven to the speed necessary to secure a high pressure, much more air would be delivered than needed, with the attendant expense for power.

GUARANTEE.—Buffalo Steel Plate Blowers and Exhausters are guaranteed to be built of the best material and workmanship, in a thoroughly workmanlike manner, to run with less power, to be more durable, to be so proportioned as to give the greatest suction and explosive force obtainable, and to be sold at lower prices for the same size and capacity than those of any other manufacture. All machines having their component dimensions or proportions at variance with Buffalo Steel Plate Fans are either inordinate consumers of power, or are of comparatively inferior air capacity.

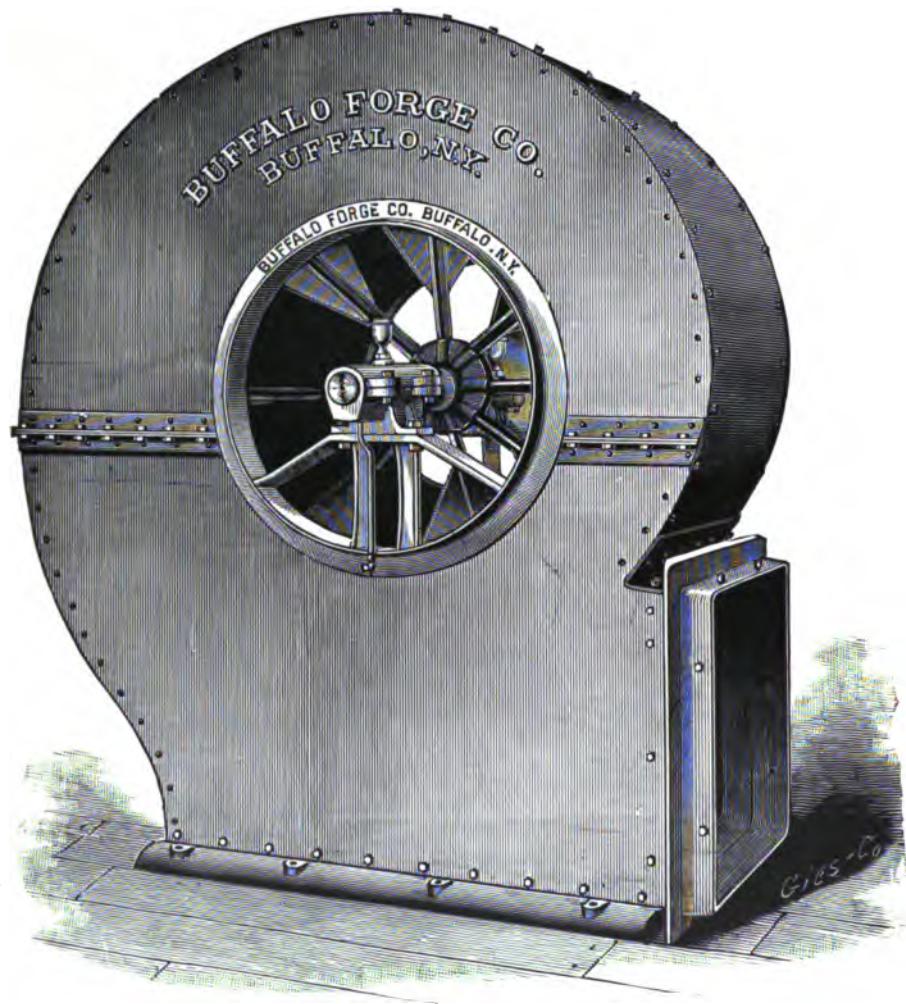
PRICE LIST FULL HOUSING BLOWERS AND EXHAUSTERS.

SIZE OF FAN	SIZE OF OUTLET	DIAM. OF INLET	PULLEYS		AVERAGE SPEED	CAP. CU. FT. AIR AT ONE OZ. PRES.	PRICE OF PULLEY FAN
			DIAM.	FACE			
50 inch.	18 $\frac{1}{2}$ x 18 $\frac{1}{2}$	24 $\frac{1}{2}$	9	7	693	11440	\$ 125.00
60 "	22 $\frac{1}{2}$ x 22 $\frac{1}{2}$	26 $\frac{1}{2}$	10	8	650	16120	175.00
70 "	26 x 26	34 $\frac{1}{2}$	11	9	509	22880	225.00
80 "	29 $\frac{1}{2}$ x 29 $\frac{1}{2}$	39 $\frac{1}{2}$	12	10	426	30160	275.00
90 "	33 $\frac{1}{2}$ x 33 $\frac{1}{2}$	43	14	11	376	39000	300.00
100 "	37 $\frac{1}{2}$ x 37 $\frac{1}{2}$	45 $\frac{1}{2}$	16	12	340	48360	400.00
110 "	41 x 41	51 $\frac{1}{2}$	18	13	307	58240	500.00
120 "	43 $\frac{1}{2}$ x 43 $\frac{1}{2}$	54 $\frac{1}{2}$	20	14	280	69680	650.00
130 "	48 $\frac{1}{2}$ x 48 $\frac{1}{2}$	61	22	15	263	82160	800.00
140 "	52 $\frac{1}{2}$ x 52 $\frac{1}{2}$	64 $\frac{1}{2}$	24	16	248	95160	1000.00
150 "	56 x 56	69 $\frac{1}{2}$	26	17	227	109200	1250.00
160 "	59 $\frac{1}{2}$ x 59 $\frac{1}{2}$	74 $\frac{1}{2}$	28	18	209	124800	1500.00
170 "	63 $\frac{1}{2}$ x 63 $\frac{1}{2}$	79	30	19	197	140920	1700.00

NOTE.—For tables of detailed dimensions see pages 38 and 39. The capacities at different speeds are tabulated on page 29. The last seven sizes are most frequently used in three-quarter housing; see pages 14 to 20. Attention is called to the uniformity of proportions of Buffalo Fans, see page 41.

Buffalo Steel Plate Blowers and Exhausters,

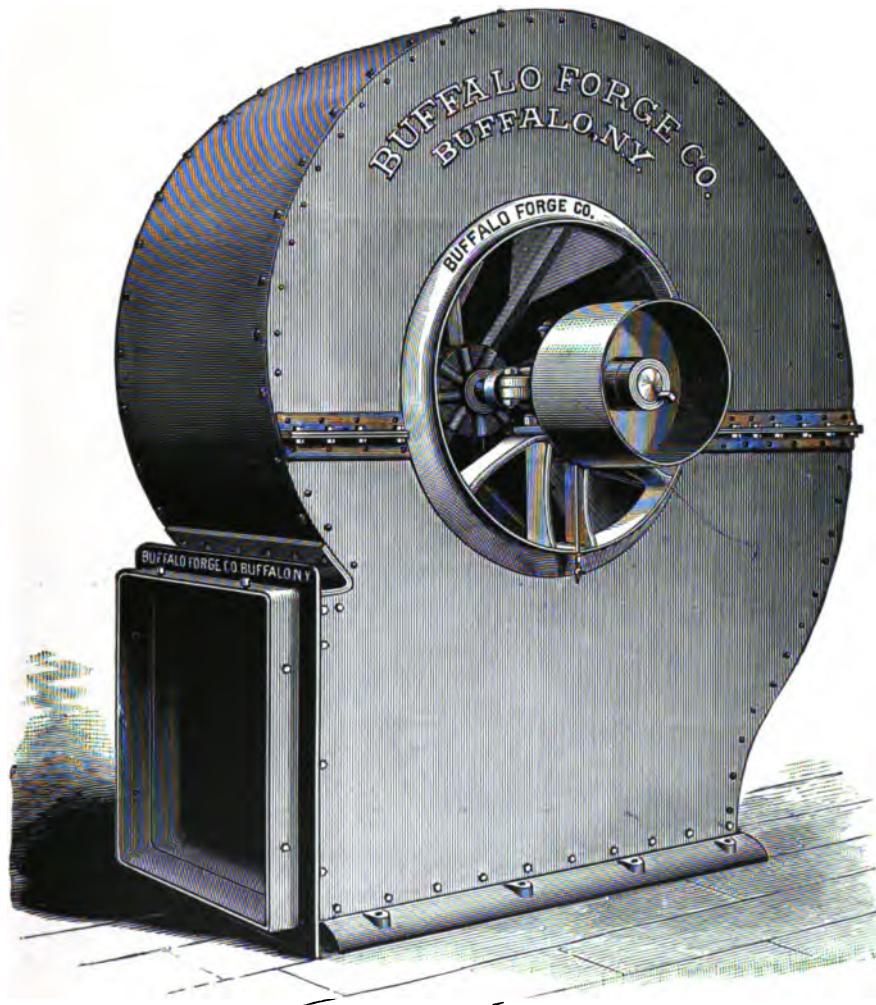
With Overhung Pulleys.



Right Hand, Bottom Horizontal Discharge. Blower Type with Inlets on Both Sides.
Exhausters have but One Inlet and Opposite Pulley. Left Hand View.

Buffalo Steel Plate Blowers and Exhausters,

With Overhung Pulleys.

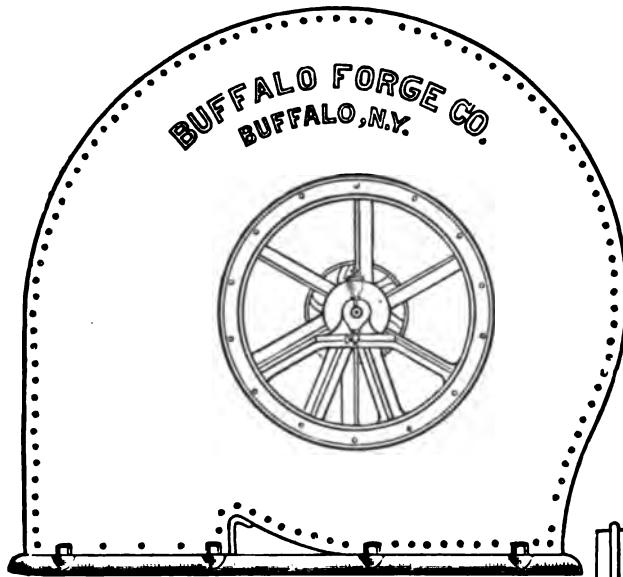


Right Hand, Bottom Horizontal Discharge. Blower Type with Inlets on Both Sides.

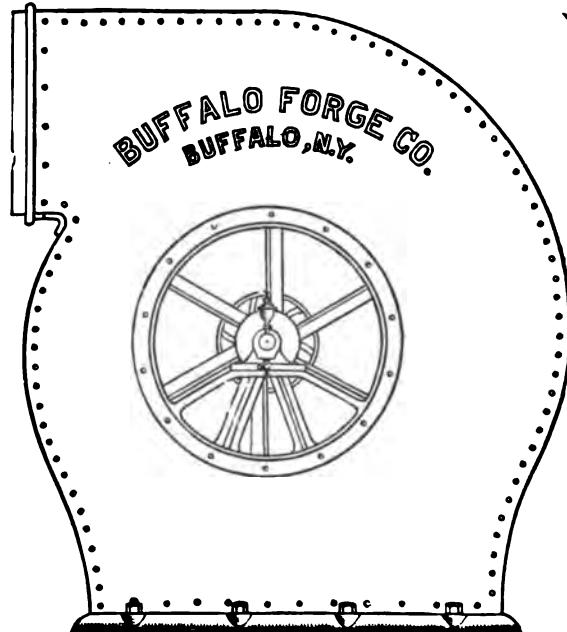
Exhausters have but One Inlet and Opposite Pulley. Right Hand View.

Buffalo Steel Plate Blowers and Exhausters,

With Overhung Pulleys.



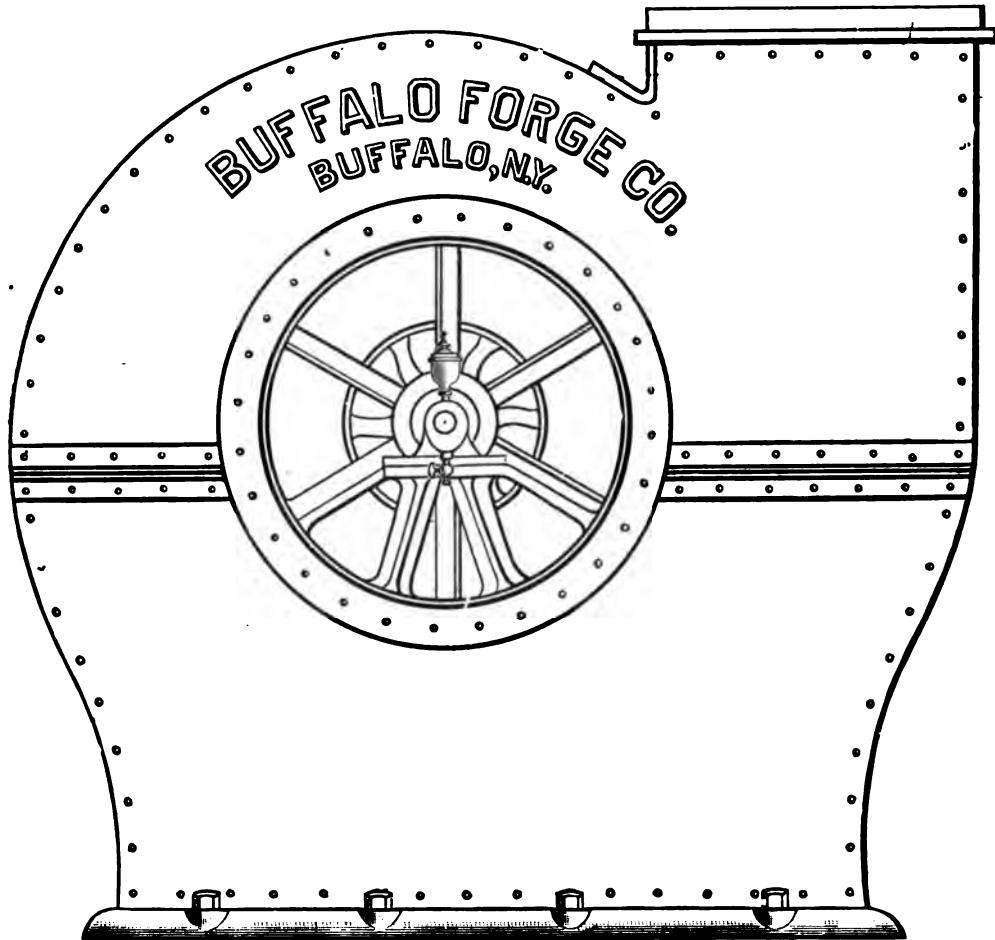
Left Hand, Down Blast,
Blower Type with Two Inlets.



Left Hand, Top Horizontal Discharge,
Blower Type with Two Inlets.

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Buffalo Steel Plate Blowers and Exhausters,
With Overhung Pulleys.



Right Hand, Up Blast, Blower Type with Two Inlets. Exhausters have but
One Inlet and Opposite Pulley.

Buffalo Steel Plate Blowers and Exhausters,

With Overhung Pulleys. Bottom Horizontal Discharge.

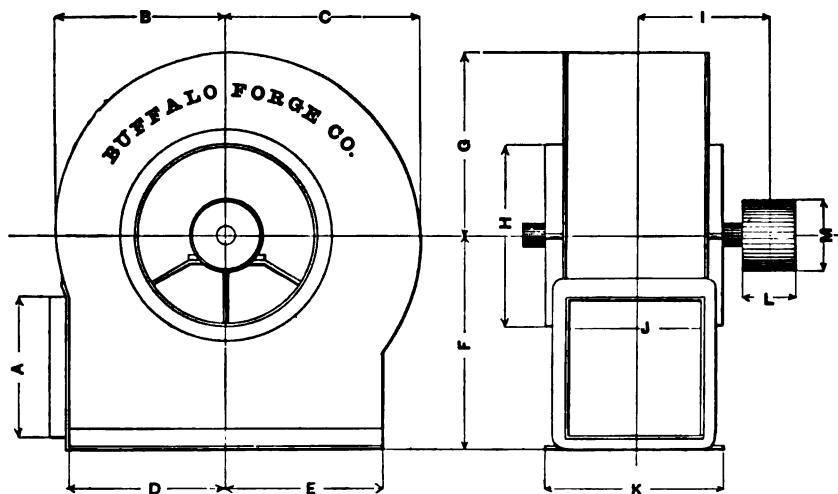


TABLE OF PRINCIPAL DIMENSIONS—IN INCHES.

SIZE	A	B	C	D	E	F	G	H	I	J	K	L	M	WEIGHT
50 in.	18 $\frac{1}{2}$	21 $\frac{1}{2}$	24 $\frac{1}{2}$	20	20	27	23	24 $\frac{1}{2}$	17 $\frac{1}{2}$	18 $\frac{1}{2}$	22 $\frac{1}{2}$	7	9	875 lbs.
60 "	22 $\frac{1}{2}$	25 $\frac{1}{2}$	29 $\frac{1}{2}$	24 $\frac{1}{2}$	24 $\frac{1}{2}$	32 $\frac{1}{2}$	27 $\frac{1}{2}$	26 $\frac{1}{2}$	19 $\frac{1}{2}$	22 $\frac{1}{2}$	26 $\frac{1}{2}$	8	10	1054 "
70 "	26	30 $\frac{1}{2}$	34 $\frac{1}{2}$	28 $\frac{1}{2}$	28 $\frac{1}{2}$	37 $\frac{1}{2}$	32 $\frac{1}{2}$	34 $\frac{1}{2}$	21 $\frac{1}{2}$	26	30 $\frac{1}{2}$	9	11	1513 "
80 "	29 $\frac{1}{2}$	34 $\frac{1}{2}$	39 $\frac{1}{2}$	32 $\frac{1}{2}$	32 $\frac{1}{2}$	43 $\frac{1}{2}$	36 $\frac{1}{2}$	39 $\frac{1}{2}$	24	29 $\frac{1}{2}$	34	10	12	1906 "
90 "	33 $\frac{1}{2}$	39	44	36 $\frac{1}{2}$	36 $\frac{1}{2}$	48 $\frac{1}{2}$	41 $\frac{1}{2}$	43	26 $\frac{1}{2}$	33 $\frac{1}{2}$	37 $\frac{1}{2}$	11	14	2332 "
100 "	37 $\frac{1}{2}$	43 $\frac{1}{2}$	48 $\frac{1}{2}$	40 $\frac{1}{2}$	40 $\frac{1}{2}$	53 $\frac{1}{2}$	46 $\frac{1}{2}$	45 $\frac{1}{2}$	28 $\frac{1}{2}$	37 $\frac{1}{2}$	42 $\frac{1}{2}$	12	16	2720 "
110 "	41	47 $\frac{1}{2}$	53 $\frac{1}{2}$	44 $\frac{1}{2}$	44 $\frac{1}{2}$	59 $\frac{1}{2}$	50 $\frac{1}{2}$	51 $\frac{1}{2}$	31 $\frac{1}{2}$	41	46 $\frac{1}{2}$	13	18	3463 "
120 "	44 $\frac{1}{2}$	52 $\frac{1}{2}$	58 $\frac{1}{2}$	48 $\frac{1}{2}$	48 $\frac{1}{2}$	64 $\frac{1}{2}$	55 $\frac{1}{2}$	54 $\frac{1}{2}$	34	44 $\frac{1}{2}$	51	14	20	4447 "
130 "	48 $\frac{1}{2}$	56 $\frac{1}{2}$	63 $\frac{1}{2}$	52 $\frac{1}{2}$	52 $\frac{1}{2}$	70	60	61	36 $\frac{1}{2}$	48 $\frac{1}{2}$	54 $\frac{1}{2}$	15	22	5800 "
140 "	52 $\frac{1}{2}$	60 $\frac{1}{2}$	68 $\frac{1}{2}$	56 $\frac{1}{2}$	56 $\frac{1}{2}$	75 $\frac{1}{2}$	64 $\frac{1}{2}$	64 $\frac{1}{2}$	39 $\frac{1}{2}$	52 $\frac{1}{2}$	59 $\frac{1}{2}$	16	24	7850 "
150 "	56	65 $\frac{1}{2}$	73 $\frac{1}{2}$	60 $\frac{1}{2}$	60 $\frac{1}{2}$	80 $\frac{1}{2}$	69 $\frac{1}{2}$	69 $\frac{1}{2}$	42 $\frac{1}{2}$	56	63 $\frac{1}{2}$	17	26	8100 "

The dimension "H" refers to blowers only. Exhausters have only one inlet, and opposite the pulley side. The diameter of inlets to exhausters is proportionately enlarged to give results equal to a blower.

Uniformity of fan proportions and capacities exists throughout all sizes; this is verified by the above table, the tables of capacities (see pages 19 and 29), and, more than all, by the fans themselves. Fans of no other manufacture show a like regulation; observe outline cuts on page 41.

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Buffalo Steel Plate Blowers and Exhausters,

With Overhung Pulleys. Top Horizontal Discharge.

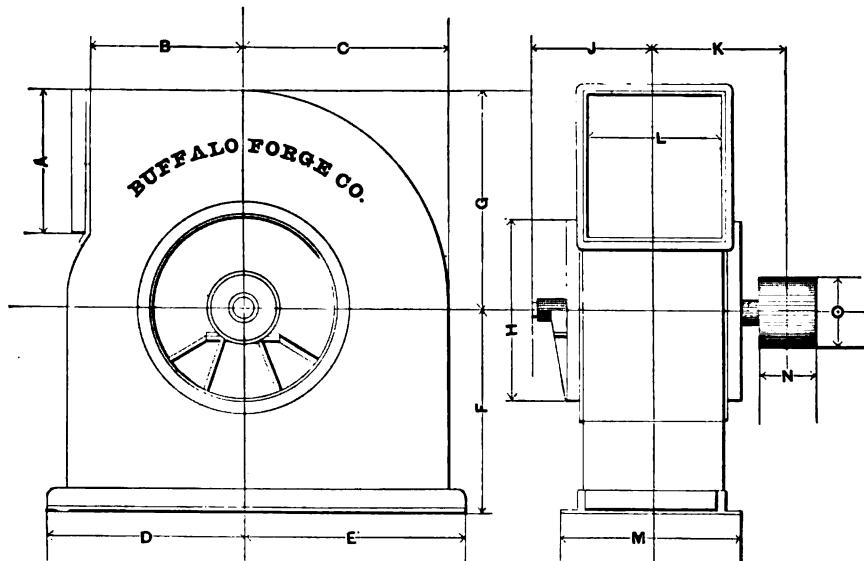


TABLE OF PRINCIPAL DIMENSIONS—IN INCHES.

SIZE	A	B	C	D	E	F	G	H	J	K	L	M	N	O	WEIGHT
50 in.	18 $\frac{1}{2}$	20	24 $\frac{1}{2}$	23 $\frac{1}{2}$	26 $\frac{1}{2}$	23 $\frac{1}{2}$	26	24 $\frac{1}{2}$	15 $\frac{1}{2}$	17 $\frac{1}{2}$	18 $\frac{1}{2}$	22 $\frac{1}{2}$	7	9	875 lbs.
60 "	22 $\frac{1}{2}$	24 $\frac{1}{2}$	29 $\frac{1}{2}$	27 $\frac{1}{2}$	31 $\frac{1}{2}$	28	31 $\frac{1}{2}$	26 $\frac{1}{2}$	17 $\frac{1}{2}$	19 $\frac{1}{2}$	22 $\frac{1}{2}$	26 $\frac{1}{2}$	8	10	1054 "
70 "	26	28 $\frac{1}{2}$	34 $\frac{1}{2}$	32 $\frac{1}{2}$	36 $\frac{1}{2}$	37 $\frac{1}{2}$	36 $\frac{1}{2}$	34 $\frac{1}{2}$	19 $\frac{1}{2}$	21 $\frac{1}{2}$	26	30 $\frac{1}{2}$	9	11	1513 "
80 "	29 $\frac{1}{2}$	32 $\frac{1}{2}$	39 $\frac{1}{2}$	36 $\frac{1}{2}$	41 $\frac{1}{2}$	37 $\frac{1}{2}$	41 $\frac{1}{2}$	39 $\frac{1}{2}$	21 $\frac{1}{2}$	24	29 $\frac{1}{2}$	34	10	12	1906 "
90 "	33 $\frac{1}{2}$	36 $\frac{1}{2}$	44	41	46	44	46 $\frac{1}{2}$	43	24 $\frac{1}{2}$	26 $\frac{1}{2}$	33 $\frac{1}{2}$	37 $\frac{1}{2}$	11	14	2332 "
100 "	37 $\frac{1}{2}$	40 $\frac{1}{2}$	48 $\frac{1}{2}$	45 $\frac{1}{2}$	51 $\frac{1}{2}$	47	51 $\frac{1}{2}$	45 $\frac{1}{2}$	25 $\frac{1}{2}$	28 $\frac{1}{2}$	37 $\frac{1}{2}$	42 $\frac{1}{2}$	12	16	2720 "
110 "	41	44 $\frac{1}{2}$	53 $\frac{1}{2}$	50 $\frac{1}{2}$	56 $\frac{1}{2}$	51	56 $\frac{1}{2}$	51 $\frac{1}{2}$	29	31 $\frac{1}{2}$	41	46 $\frac{1}{2}$	13	18	3463 "
120 "	44 $\frac{1}{2}$	48 $\frac{1}{2}$	58 $\frac{1}{2}$	55 $\frac{1}{2}$	61 $\frac{1}{2}$	56	61 $\frac{1}{2}$	54 $\frac{1}{2}$	31 $\frac{1}{2}$	34	44 $\frac{1}{2}$	51	14	20	4447 "
130 "	48 $\frac{1}{2}$	52 $\frac{1}{2}$	63 $\frac{1}{2}$	59 $\frac{1}{2}$	66 $\frac{1}{2}$	61	67	61	33 $\frac{1}{2}$	36 $\frac{1}{2}$	48 $\frac{1}{2}$	54 $\frac{1}{2}$	15	22	5800 "
140 "	52 $\frac{1}{2}$	56 $\frac{1}{2}$	68 $\frac{1}{2}$	64 $\frac{1}{2}$	71 $\frac{1}{2}$	65 $\frac{1}{2}$	72 $\frac{1}{2}$	64 $\frac{1}{2}$	36 $\frac{1}{2}$	39 $\frac{1}{2}$	52 $\frac{1}{2}$	59 $\frac{1}{2}$	16	24	7850 "
150 "	56	60 $\frac{1}{2}$	73 $\frac{1}{2}$	68 $\frac{1}{2}$	76 $\frac{1}{2}$	70 $\frac{1}{2}$	77 $\frac{1}{2}$	69 $\frac{1}{2}$	38 $\frac{1}{2}$	42 $\frac{1}{2}$	56	63 $\frac{1}{2}$	17	26	8100 "

The dimension "H" refers to blowers only. Exhausters have only one inlet, and opposite the pulley side. The diameter of inlets to exhausters is proportionately enlarged to give results equal to a blower.

Uniformity of fan proportions and capacities exists throughout all sizes; this is verified by the table above, the tables of capacities (see pages 19 and 29), and, more than all, by the fans themselves. Fans of no other manufacture show a like regulation; observe outline cuts on page 41.

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Buffalo Steel Plate Pulley Fan Wheels,

For Housings of Wood or Brick.



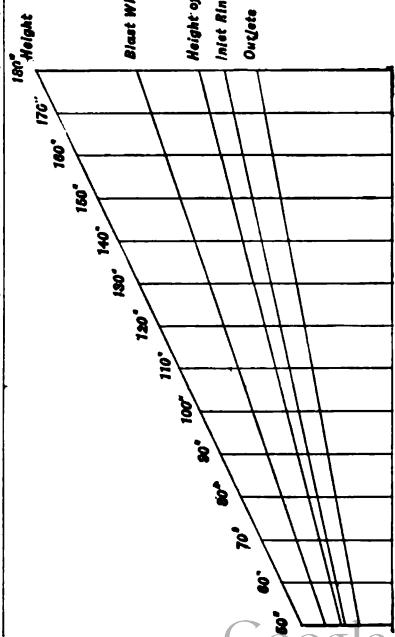
Fan Wheel with Shaft, Pulley and Bearings.



Fan Wheel without Shaft, Pulley or Bearings.

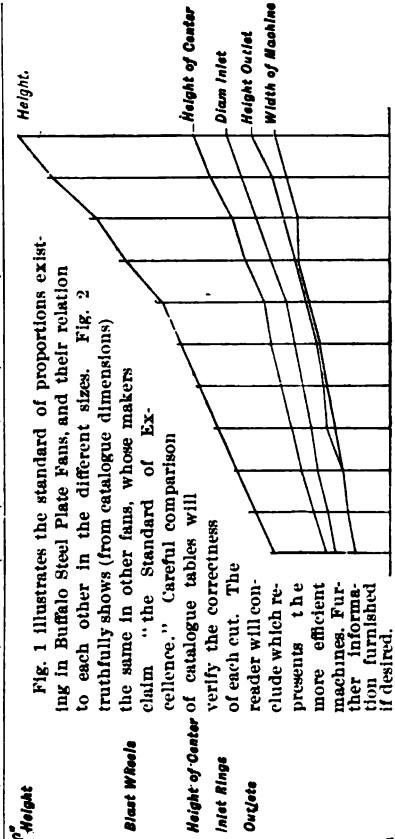
Price List and Capacities of Buffalo Fan Wheels.

SIZE OF OUTLET IN INCHES	DIAMETER OF FAN WHEEL IN FEET	WIDTH OF STANDARD FAN WHEEL IN INCHES	DIAMETER OF INLET IN INCHES	WIDTH OF FAN WHEEL IN INCHES	PRICE OF FAN WITH BOXES, SHAFTS AND PULLEYS COMPLETE		
					1/4-OZ. PRESSURE	1/8-OZ. PRESSURE	VELOCITY
5	30	40	31 x 31	50	6249	100	61 FT. PER SEC.
6	36	48	37 $\frac{1}{2}$ x 37 $\frac{1}{2}$	42	6494	59	43 FT. PER SEC.
7	42	56	44 x 44	35	9042	49	35 FT. PER SEC.
8	48	64	50 $\frac{1}{2}$ x 50 $\frac{1}{2}$	31	11682	44	27 FT. PER SEC.
9	54	72	57 x 57	27	14982	38	21 FT. PER SEC.
10	60	80	63 x 63	24	18282	34	16 FT. PER SEC.
11	66	88	69 x 69	22	21978	31	13 FT. PER SEC.
12	72	96	76 x 76	20	26684	28	10 FT. PER SEC.
13	78	104	82 x 82	18	31020	26	8 FT. PER SEC.
14	84	112	88 x 88	17	35772	24	6 FT. PER SEC.
15	90	120	94 x 94	16	40656	22	4 FT. PER SEC.



Proportion Standard of Buffalo Steel Plate Fans. Fig. 1.

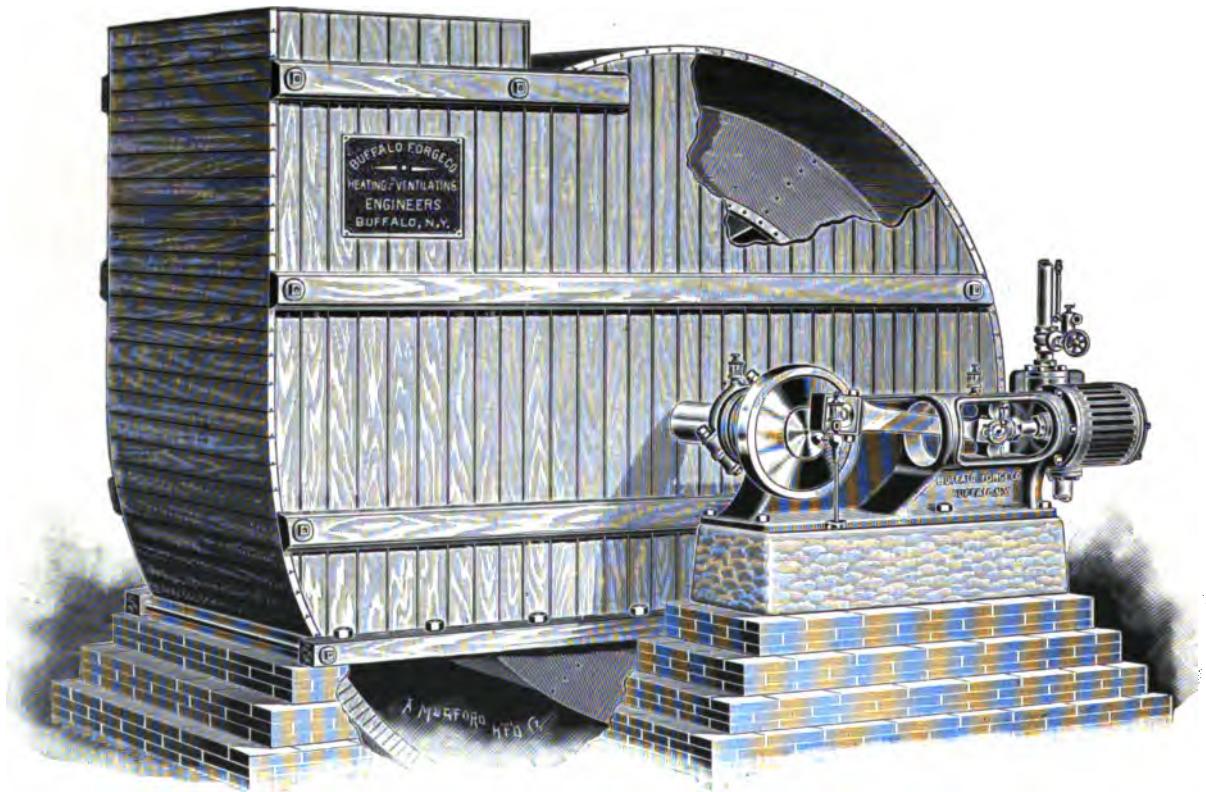
Fig. 1 illustrates the standard of proportions existing in Buffalo Steel Plate Fans, and their relation to each other in the different sizes. Fig. 2 truthfully shows (from catalogue dimensions) the same in other fans, whose makers claim "the Standard of Excellence." Careful comparison of catalogue tables will verify the correctness of each cut. The reader will conclude which represents the more efficient machines. Further information furnished if desired.



Proportion Standard of Fans claimed "the Only Perfect." Fig. 2.

Buffalo Steel Plate Fan Wheel,

For Brick and Wood Housings.



Fan Wheel in Three-quarter Wood Housing, with Direct Attached Horizontal Engine. Built as Right Hand Up Discharge Exhauster. A Common Form for Mine Ventilation.
Wood Housing at Top, and Brick at Bottom Broken, to Show Wheel.

Buffalo Steel Plate Fan Wheels,

For Brick and Wood Housings.

THE engravings appearing on page 40 plainly show the designs and construction of the Buffalo Fan Wheels. Two forms of spiders are employed, viz., single and double; the former for average size fan-wheels, and the latter for great diameters. These wheels are employed for ventilating and similar work, where it is desired to handle a large volume of air at a moderate velocity, as a rule not exceeding one to one and a half ounces per square inch.

Built into brick and wood housings (see opposite page), they have found great favor with mine owners and operators, for ventilating mines. In this capacity, they have, in a large number of instances, superseded, at a great saving of power and consequent running expenses, the antiquated forms of wooden fans, which, previous to the introduction of Buffalo Steel Plate Fan Wheels, have been widely used for ventilating apartments of mines. The Steel Plate Full Housing and Three-quarter Housing Fan types are also widely used for this purpose. The fan wheels are equally well adapted for ventilating railway and other underground tunnels, large basements, public buildings, prisons, etc., and for this service have been applied with marked success. As the ventilation of mines is commonly accomplished through long tunnels, usually emanating from a mountain or hill, and by exhausting the air, ready connection may be made with a fan of the form shown on opposite page. The discharge is directly upward, and the least liable to be affected by natural conditions.

As will at once be recognized, our patented bearing with the oil ring, which is unsurpassed for either high or low speeds, is embodied in the building of these machines. The construction of all blast wheels requires the greatest skill to secure smooth running at high speeds. The method in vogue at our works of securing a perfect metalline counterpoise has been so systematized as to render it unnecessary to employ numerous weight patch pieces at different points on the wheel, commonly used by certain manufacturers in balancing.

The Buffalo Fan Wheels can be used as exhausters with but one inlet, or as blowers having two inlets provided in the brick or wood housing, as may best meet requirements of the work.

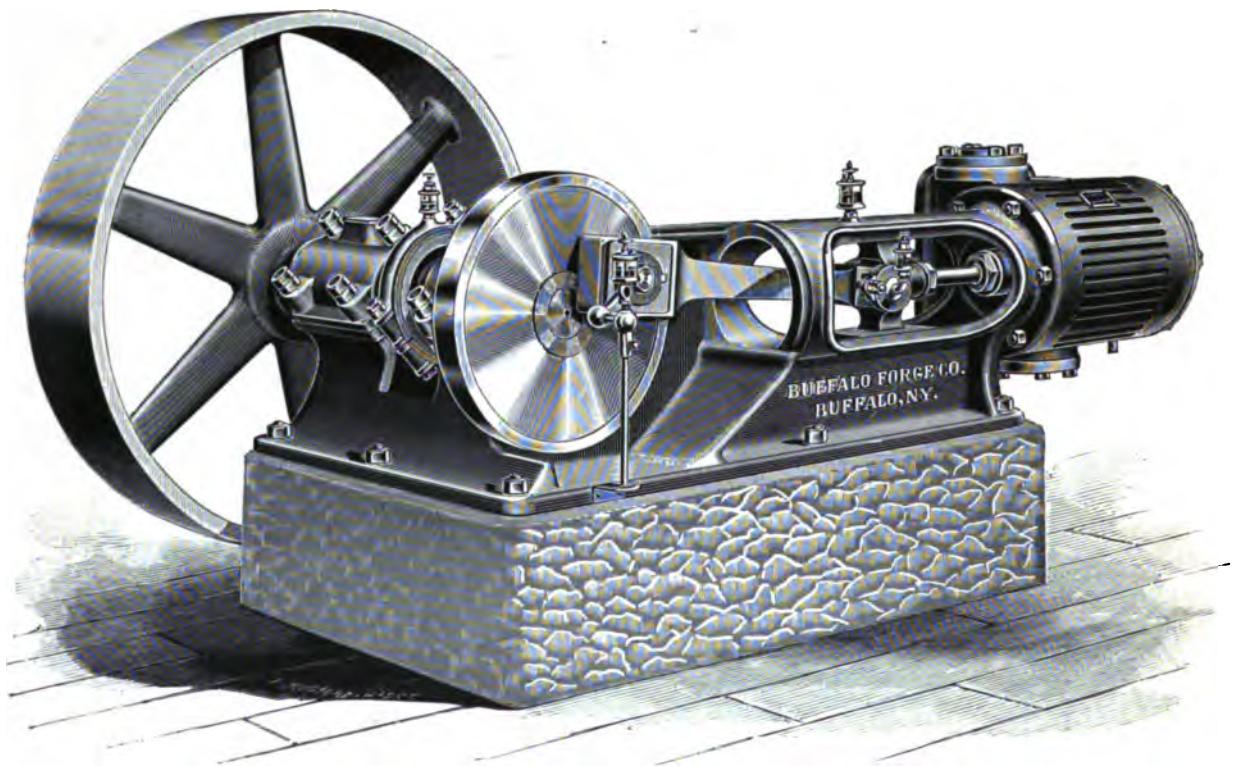
Where desired for handling fumes or gases of such nature as rapidly attack and destroy the steel plate ordinarily used in their construction, we can readily furnish the fan wheels made of copper and the housings can then be lined or coated with copper, lead, zinc, tin or asphaltum. Such circumstances usually exist in chemical and similar works. Often in such conditions the housings may be made of wood and will not require any protection, this being dependent upon the chemical composition of the gases handled by the fan.

Where Buffalo Fan Wheels are supplied to our customers with steam motors, the Buffalo Horizontal and Upright Engines, elsewhere described, which are especially suited for fan propulsion, are furnished direct connected to the shaft of the fan wheel, or if the conditions of application are better suited, the wheels are then driven by a Self-contained Engine, located to run by a convenient belt connection. For running without cessation for long periods, common to mining operations, the Double Direct Connected Engines afford superior advantages over the Single type. Quite a number of fans have been furnished for this service with the Double Direct Connected Vertical Engine entirely encased, to prevent dust reaching the reciprocating parts, and their special adaptation is at once appreciated.

The fan wheel, with its accompanying shaft, pulley and bearings, illustrated on page 40, is of the general type used in the Buffalo Steel Plate Steam and Pulley Fans. For large volumes of air at moderate velocity, the wheels are built wider than where high pressures of air are required for special work, the form then taken assuming the opposite, i. e., a narrow wheel with proportionately enlarged peripheral velocity.

With every order for Buffalo Pulley and Steam Fan Wheels, complete detailed drawings for building the housing and foundation will be furnished.

Buffalo Self-contained Horizontal Engine.



Engraving Exact Reproduction from a Photograph Taken of the
10 x 8 Size.

Buffalo Self-contained Horizontal Engine.

ALTHOUGH all the engines constructed in that department of our works are especially designed with reference to driving fans, we can confidently recommend them for use wherever a first-class engine of the sizes of our manufacture is desired.

The Buffalo Horizontal Engine, illustrated on page 44, is self-contained. The frame may be styled a combination of the tangye and girder types, and the distribution of material throughout is such as to give ample rigidity. Through the medium of a rocker, motion of the valve is derived, and all joints in this gear are adjustable for wear. The cylinder is designed to give the highest efficiency with minimum condensation. It is bolted to the frame, and the front head is cast as a part of it, the stuffing box being forced in. The crosshead is fitted with a tapered hardened wrist pin, and the connecting rod has a wedge adjustment at both ends. The crank pin is furnished with Babbitt-lined brass boxes; the crosshead pin has solid phosphor bronze bearings. The crank disc is of cast iron, shrunk on the shaft, and keyed. The pin is forced into the disc by an ingenious method, which insures it being perfectly parallel with the shaft, and this projects beyond the bearing to receive the fly-wheel, as shown. To prevent cutting, the eccentric, which is of cast iron, has a Babbitt-lined eccentric strap, and the rod is secured to the strap by a novel method which permits of changing the valve position without removing the cover. The rocker has large wearing surfaces, and is fitted with hardened steel pins, the distance between centers being such as to prevent undue vibration of the valve rod. The valve is of the plain slide "D" pattern, and carefully scraped to its seat under pressure, being annexed to the valve rod by securely locked nuts. To prevent corrosion, brass glands are provided for the stuffing boxes. The fly-wheel is heavy to secure steady running. All reciprocating parts are counterbalanced. The cylinder, valve and piston are made of special metal, insuring a uniform wearing of parts.

Our attention has been called to a number of the Buffalo Horizontal Self-contained Engines which have been run for months without internal lubrication. The cylinder design and method of securing frame ensures perfect alignment, at the same time preventing leakage at the joints. No wrought iron is used in any part. Means for adjustment are provided at all wearing surfaces. The lubrication is positive under any speed.

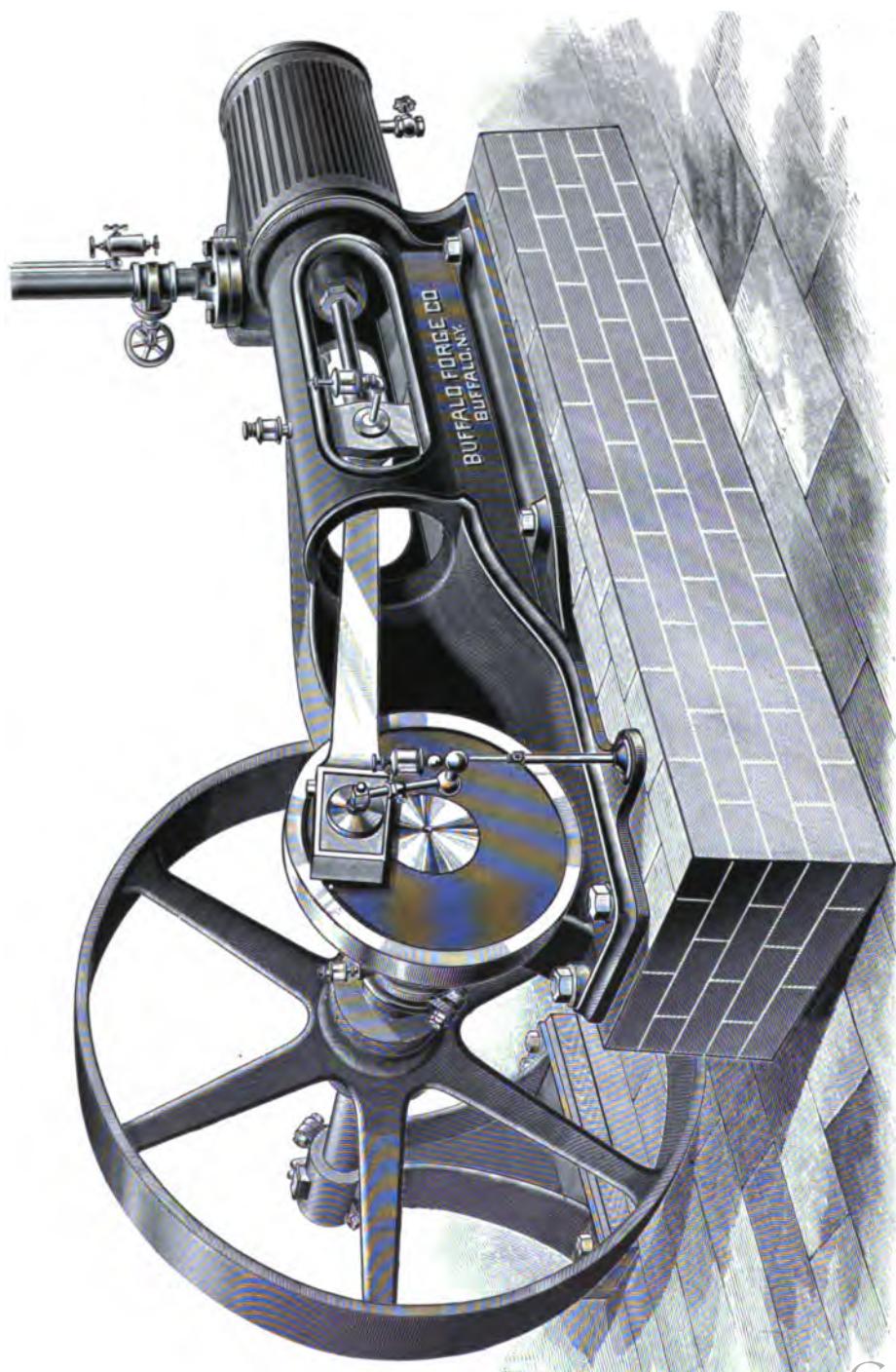
As will be observed by the engraving on page 46, Buffalo Horizontal Engines are also built and furnished with outer bearing and fly-wheel. The general points of construction and material are similar to the regular Self-contained Engines described in full above. Very largely, the durability of an engine is dependent upon the simplicity of its construction, and the Buffalo Horizontal Engines upon this point have distinct advantages in their favor. From the erection floor, every engine goes to the testing room, where it is piped to steam at the pressure under which it is to operate, and run continuously under conditions of regular service, and otherwise inspected in a most thorough manner. To meet the demand of a large and steadily increasing trade, we carry in stock the standard sizes, so that we are enabled to make shipments as promptly as with any of our regular Heating and Ventilating Apparatus with which the engines described are commonly used. Each engine is supplied with a full complement of sight-feed oilers, and necessary wrenches, suitable for every bolt and nut thereon. Where these engines are used for supplying power for various machinery, and whenever required, they are furnished with a standard governor of approved design.

The quality of workmanship and material, and the efficiency of the Buffalo Horizontal Engines throughout is fully guaranteed.

For table of detailed dimensions, horse power, etc., of the different sizes, see page 47.

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Buffalo Horizontal Engine.



With Fly-wheel and Pedestal Bearing.

Buffalo Self-contained Horizontal Engines.

CYLINDER		REVOLUTIONS PER MINUTE	HORSE POWER	TABLE OF PRINCIPAL DIMENSIONS—IN INCHES							WEIGHT COMPLETE	PRICE	
Diameter in Inches	Stroke in Inches			Diam.	Face	Diam.	Diam.	Length	Pipes	Steam	Exhaust		
5	7½	350	10.	30	5	2½	1½	2	1½	1½	1½	.	.
6	8	325	14.7	32	5½	2¾	2	2½	1½	2	2	.	.
6½	8½	300	17.	36	6	3	2½	2½	1½	2	2	.	.
8	8	275	22.4	40	8	3½	2½	3	2	2½	2½	.	.
10	8	260	33.	40	10	3½	2½	3	2½	3	3	.	.
10	12	225	60.	60	11	4½	3½	3	3	3	3½	.	.
12	14	280	66.	72	14	5	3½	3½	3½	3½	4	.	.
12	12	240	45.	54	10½	4	3	3	2½	3	3	.	.
12	16											.	.

For engraving of engine see page 44.

Buffalo Self-contained Upright Engines.

CYLINDER		REVOLUTIONS PER MINUTE	HORSE POWER	TABLE OF PRINCIPAL DIMENSIONS—IN INCHES							WEIGHT COMPLETE	PRICE	
Diameter in Inches	Stroke in Inches			Diam.	Face	Diam.	Bearings	Diam.	Length	Pipes	Steam		
3	4	350	2.52	18	3	2½	7 x 7	1½	2	1	1½	.	.
3½	5	325	4.5	20	3½	2½	7 x 7	1½	2	1	1½	.	.
5	7	400	15.	24	4	2¾	5 x 8	2	1½	1½	1½	.	.
5½	7	390	18.5	26	4½	2¾	5 x 8	2	1½	1½	1½	.	.
6	8	320	20.7	30	5	2½	7½ x 10½	2½	2	1½	2	.	.
6½	8	310	22.6	36	5½	2½	7½ x 10½	2½	2	1½	2	.	.
7	9	275	24.5	42	6	3	8 x 11½	2½	2½	2	2½	.	.
7½	9	265	26.	48	7	3	8 x 11½	2½	2½	2	2½	.	.

For engraving of engine see page 48.

Buffalo Self-contained Upright Engine.



Single Balanced Valve, Piston Type.

Buffalo Self-contained Upright Engines.

THE Buffalo Self-contained Upright Engine, illustrated on page 48, is so constructed that defective foundations do not destroy its alignment, with the usual attendant effect of pounding and heating. Used with Steel Plate Fans, the wheels are overhung, both bearings being supported by the engine frame and base. With the other forms of construction, where an outer bearing is required on the fan side opposite engine, frequent adjusting is required to keep a direct attached engine running smooth. This will be present if the foundation is only slightly out of true, for the shell of the fan will permit sufficient springing to bring it down; all such features are happily eliminated in the Buffalo Self-contained Upright Engine. Where a single engine is required to drive Buffalo Steel Pressure and "B" Volume Blowers, placed on the same bed-plate, this type is invariably employed. At high speeds with heavy loads, its steadiness and uniformity of motion is unsurpassed, and clearly demonstrates that its fitness for fan propulsion is without a peer.

The design and proportion of the frame are such as give great rigidity and width of base, with all the working strains in a straight or central line. The cylinder is cast on and bored at the same operation with the guides, ensuring its being concentric, and in perfect alignment therewith. The bearings, large in their ratio, are fitted with self-oiling rings (see page 23), are lined with special Babbitt metal, and bored by special jigs at right angles to the guides and cylinder. As also adopted for the Buffalo Double Vertical Engines, the piston is of the approved snap ring type, screwed into the crosshead and secured by a split joint, instead of the conventional jam nut. The crosshead is bored and tapered, to receive the hardened steel rod pin, and is made as light as is consistent. The crank is of crucible cast steel, with the eccentric cast into it. The valve is of the well-known and approved piston type, fitted with especial care; the valve chest is bolted to the cylinder, so that when the valve becomes worn the chest may readily be removed for repairs. The connecting rod has Magnolia metal bearing on crank end, and phosphor bronze bushing; this, with the extra large valve rod, forms a guide to prevent springing and side wear of valve. The rocker arm or its substitute is studiously avoided.

OILING.—It is a recognized fact that, in high speed reciprocating or rotating parts, nearly 75 per cent of the oil supposed to reach them, when the ordinary oil cup or more modern wipers are used, is carried by the centrifugal force *from*, instead of *to* the bearings, and, much to the disgust of the tidy engineer, thrown promiscuously about the engine room. To overcome this, a unique, positive and effective oiling method is employed on all Buffalo Vertical Engines of the later designs. The crank pin is oiled throughout the shaft, which is bored hollow for the purpose, and fed by a sight-feed oil cup, through which it is possible to regulate the amount of oil supplied. The crosshead pin is oiled by a tube leading from the crank pin; the bearings are oiled by the self-feeding oil rings, see page 23. The remainder of the wearing surfaces are oiled by means of cups especially adapted for such parts. This approved method of oiling the Direct Attached Upright Fan Engines is well shown by the engraving on page 9.

Seeking only for the best, we have, after a long experience, adopted this ingenious oiling system, as being without a parallel. Every engine, before leaving our factory, is subjected to a continuous run of twelve hours, after being thoroughly adjusted, and the valve set with indicator on.

A department of our works is set aside solely for the manufacture of steam engines, and equipped not only with all the latest improved tools of standard manufacture, but with a large number of special devices designed with particular reference for our line of engines.

Buffalo Hot Blast System of Heating and Ventilating.

IT IS not proposed to enter into a lengthy portrayal, or discuss the comparative effectiveness, healthfulness, economy and cost of installation of the various apparatus now being offered, as it would not come within the scope of a catalogue description. The sole purport, therefore, of the accompanying descriptions and engravings of applications is to help progressive patrons, who desire the best at a moderate outlay.

Numerous volumes upon the subject of heating and ventilation have been compiled within the past century, yet it can safely be asserted that few possess any amount of real value. Many of these emanate from manufacturers whose interests are directly centered in some patented stove, grate or furnace, who will argue that their particular invention is a panacea for all the ills of heating.

Whether it be for the heating and ventilation of factories, mills or hospitals, legislative halls, theatres and this class of structures, a careful, thorough and honest investigation of existing buildings, outfitted with various apparatus, upon the part of the intelligent buyer, can reach but one ultimatum, viz: that a plant combining the features of steam heat and mechanical ventilation is, from the points of efficient results and economical operation, the only one worthy of installation.

These features are most happily combined in the Buffalo Hot Blast Steam Heating and Ventilating Apparatus. Its component parts comprise a fan, a motor, a steam heater, and a system of air distributing ducts; under certain conditions of application, the latter becomes unnecessary, or is reduced to a very small item.

Cheapness is not the argument used in favor of the Fan or Plenum System, or the lever by which it has received its rapid advancement to popular favor and introduction. It is nevertheless true, that in many instances of installation, not only into manufacturing establishments, but into that type of buildings occupied for business and entertainment purposes, the first cost is less than that of any other system, even of heating alone. Generally speaking, however, the first cost may be counted upon as equaling, if not exceeding, that of direct steam radiation, hot air furnaces, etc. The point should not be overlooked that an amount expended for the latter class of outfits covers but one item, that of *heating*; no other than mechanical ventilation by a fan can be relied on as being positive in its action at all times and under all conditions of the weather. Granting this, and adding to that of the heating apparatus the cost of a fan ventilating outfit, at as low a figure as it is possible to place an efficient one, and we have the only fair basis for comparison in the matter of price.

It is only too well appreciated by many occupants of factories that the atmosphere is neither agreeable, comfortable nor healthful. Manifold noxious gases, incident to many manufacturing interests, so combine with air already vitiated by the respiration of operatives as to make it foul in the extreme. To the legislative and socialistic movement, concerning the protection and comfort of employees, which has so interested the public at large, may be ascribed considerable credit for the bettering of such situations by the introduction of ventilating fans. Where proprietors are compelled by factory inspectors to install these ventilating arrangements, then they are often more ready to adopt, especially if erecting a new building, an apparatus which will not only heat the space, but ventilate it at the same time.

Buffalo Hot Blast Apparatus, in summer, may be used solely for ventilating and cooling purposes; while in winter, a supply of fresh air being generally admitted to the fan, the ventilation is equally well accomplished at the same time the heating is being performed.

Buffalo Hot Blast System of Heating and Ventilating.

OF ALL structures, the factory, undoubtedly, is the most difficult type to warm *uniformly* by direct heating systems, such as steam coils, stoves and the like, due to cold air being constantly admitted by opening doors, loosely fitted windows, etc. With the Buffalo Hot Blast Apparatus, the air is forced by a fan continually to every portion of the buildings, by means of judiciously arranged distributing pipes, and thus a very even temperature is secured in each point. The space to be heated may be a one-story manufacturing establishment, several of this type, or one or more buildings with a number of stories, yet there is no difficulty in securing like results in each instance under an intelligent arrangement of the heating plant. This fact, coupled with the usual small difference in cost between hot blast heating and direct steam for mills, has figured prominently in its wide introduction therein.

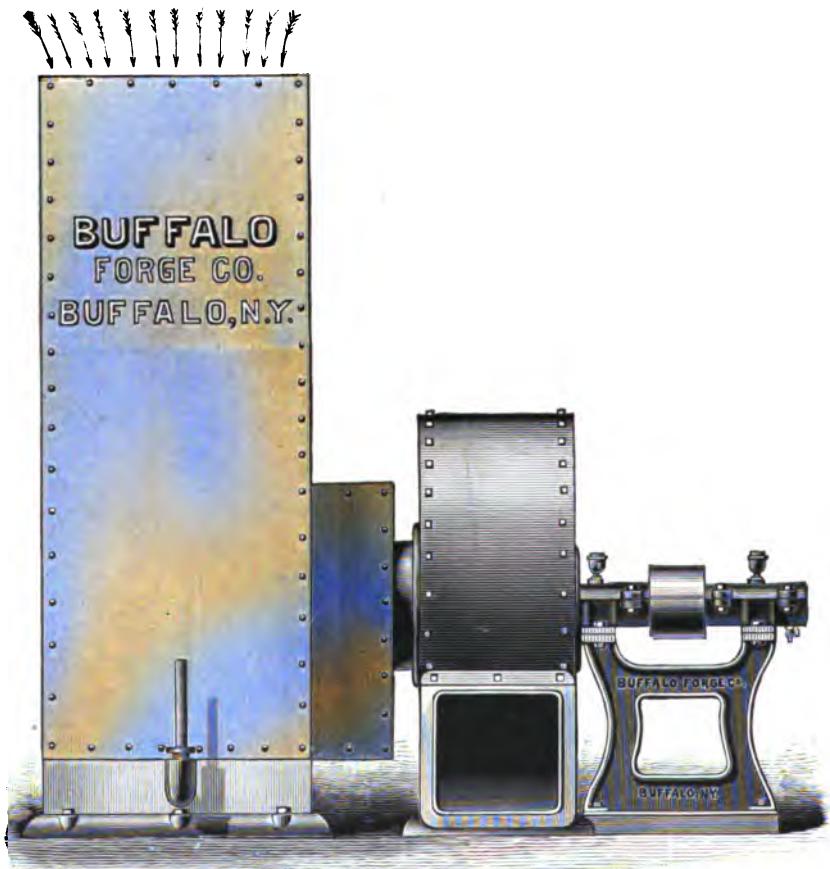
In the example of business and public structures, the feasibility of heating the space evenly throughout by direct methods is more easily attained. In view of this, to actuate the selection of the Hot Blast System, it must embody other points of merit equally cogent; these are clearly apparent in numerous instances. The possibility of a fresh, even and ample supply of air under perfect regulation as to humidity and temperature at all times, regardless of natural conditions, is an argument which always commands consideration. This is attained in the Buffalo Steam Hot Blast Apparatus, for it embodies the most happy combination of hot air heating and ventilation extant.

Frequently buildings may be seen where a number of thousands of dollars have been expended for handsome exterior architectural effects, that should have had the amount so equalized that a modern heating and ventilating system could have been placed. Beautiful and imposing structures we never fail to admire, but the arrangement for securing a reliable heating and ventilating outfit should be planned in every detail with as much interest and intelligence as the construction of any other portion shows. This being done, we will then find a model apparatus, well proportioned flues, boiler, engine and heating outfit apartments conveniently arranged, and, in short, a complete and efficient plant.

In Billings' "Principle of Ventilation and Heating," the author states "in this climate it is impossible to have, at the same time, good ventilation, sufficient heating and cheapness. The fact that good ventilation is expensive is not so well recognized as it should be," etc. Ventilation is expensive when arrangements for it have to be provided in existing buildings, previously planned in utter ignorance of such requirements, when we have to diminish the supply of fresh air to the smallest permissible amount in order to be allowed to introduce it at all. Plans for ventilation should always be perfected and approved of by one familiar with mechanical ventilation, before the construction of the building is commenced, when the cost for providing for an entirely satisfactory plant, by having the flues of proper dimensions built in the walls, is very slight. The cost then of the Buffalo Hot Blast Apparatus will seldom exceed or equal the outlay for many of the unreliable hot air furnaces, or other devices, claiming to obtain ample ventilation by combining hot and cold air. It does not matter how carefully or thoroughly such a plant may be designed, no certain amount of air can positively be relied on as being supplied to every room, irrespective of outside conditions. Only by forcing fresh heated air under pressure to the several apartments can uniform results be obtained.

Upon mechanical means, solely, is the operation of the Buffalo Hot Blast Apparatus dependent. Its action, therefore, obviously is positive, not dependent upon atmospheric conditions, direction and force of the wind, but it always supplies the full required amount of pure air comfortably warmed.

Buffalo Steam Hot Blast Apparatus.



Steel Plate Exhauster, Solid Base Heater, with Steel Pipes.

Buffalo Steam Hot Blast Apparatus,

Steel Plate Exhausters and Solid Base Heaters.

WHERE a small Hot Blast Apparatus is required for drying purposes, heating certain sections of factories, offices, etc., and for tempering the air of basements and other spaces, the form illustrated on the preceding page is very convenient and the simplest built. As will be observed, the fan is designed for handling hot air, both bearings being upon one side, the fan wheel being overhung, and leaving the inlet at the opposite side unobstructed.

The heaters have a cast iron solid base with a diaphragm dividing it into sections, to which the pipes are attached vertically, steam entering one side of base, passing up through the pipes, the condensation passing out at the opposite side. The entire heating surface is thus utilized. The air supply to the fan is taken from the top of the apparatus, from the room in which the outfit sets, or it may be derived through a pipe connecting the apparatus with a stated point from which it is desired to draw the fresh air. The construction of the heaters is such that live or exhaust steam may be used; the heater is entirely encased, excepting at the top where the air is supplied, by a steel plate jacket with a receiving chamber for the air between it and the fan.

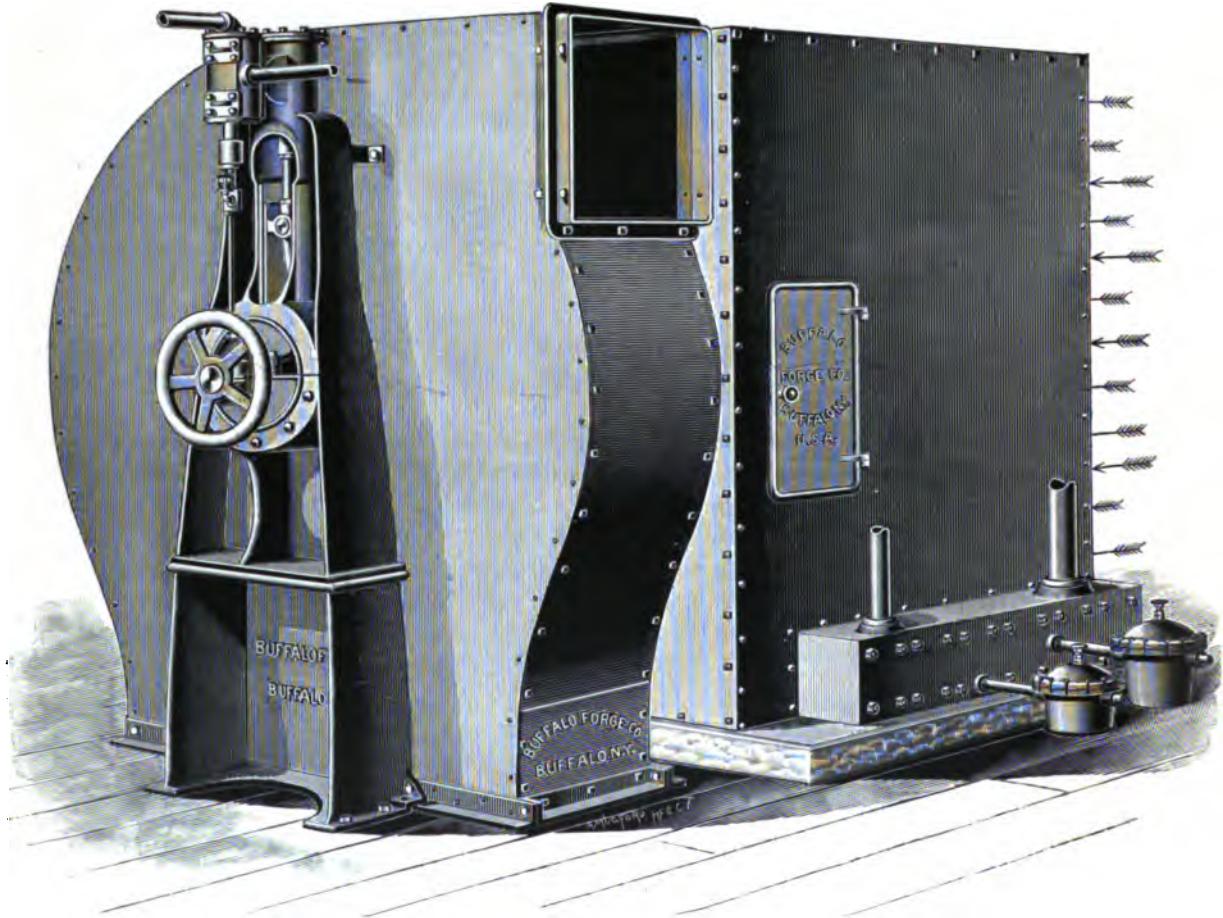
The fans are made either right or left hand, as desired, and to discharge either bottom or top horizontal, or up blast. These small heaters are furnished arranged to blow through them where required, and this form often renders them more suitable to the location and work to be done. The form and space assumed by the outfit when thus constructed, however, is different from that described herewith.

For drying fruit, wool, cotton, grain, leather, glue, tobacco, jute, fibrous material, and in small lumber and brick dryers, these outfits have found great favor with users. Very little power is required to operate the plant, and a far more efficient drying arrangement is thus secured than when direct steam coils are provided for the purpose.

SIZE OF APPARATUS	DIAMETER OF FAN OUTLET	DIAMETER AND FACE OF PULLEYS	ORDINARY SPEED OF FAN	CAPACITY OF FAN IN CU. FT. OF AIR	HEATER CAPACITY IN SQ. FT. OF HEATING SURFACE	FLOOR SPACE OF FAN AND HEATER	WEIGHT OF FAN AND HEATER.	PRICE OF HEATER AND CASE	PRICE OF FAN AND HEATER WITH CASE
30 in.	9 $\frac{1}{2}$ x 9 $\frac{1}{2}$	6 x 4 $\frac{1}{2}$	1460	3224	300	2 ft. 3 in. x 4 ft. 2 in.	875 lbs.	\$ 65.00	\$130.00
35 "	11 $\frac{1}{2}$ x 11 $\frac{1}{2}$	7 x 5 $\frac{1}{2}$	1173	4524	576	3 " x 4 " 11 "	1695 "	140.00	210.00
40 "	13 $\frac{1}{2}$ x 13 $\frac{1}{2}$	8 x 6	1035	6552	648	3 " 2 " x 5 " 5 "	2041 "	162.00	250.00
45 "	15 x 15	9 x 6 $\frac{1}{2}$	964	8112	864	3 " 6 " x 6 " 6 "	2638 "	216.00	330.00
50 "	18 $\frac{1}{2}$ x 18 $\frac{1}{2}$	9 x 7	693	11440	1132	3 " 10 " x 7 " 6 "	3314 "	283.00	430.00
60 "	22 $\frac{1}{2}$ x 22 $\frac{1}{2}$	10 x 8	650	16120	1490	4 " 6 " x 9 " 2 "	4730 "	370.00	470.00
70 "	26 x 26	11 x 9	509	22880	1786	5 " 2 " x 8 " 8 "	5632 "	445.00	695.00

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Buffalo Steam Hot Blast Apparatus.



Arranged for Low Pressure Steam and to Exhaust Through Heater.

Steam Fan, Cylinder above Shaft.

Buffalo Steam Hot Blast Apparatus,

Exhausting Through Heater, See Opposite Page.

It has been demonstrated by observation and careful tests of duplicate buildings, side by side, equipped with Buffalo Hot Blast Apparatus, built both for exhausting and blowing through, that for ordinary heating and ventilating work there is, in actual results secured little, if any, difference between the two forms. In the descriptions of heating and ventilation of public buildings which follow, it will be observed that we often apply these outfits to supply every room with both warm and cold air, the amount of each being regulated at will of operator. Under this method of application, the apparatus cannot assume the exhausting type. For certain drying work, the blow-through style also possesses points of value not to be secured in the other arrangement. Excepting when the conditions above referred to exist, the form the outfit shall assume is, therefore, contingent solely upon the convenience and cost of application.

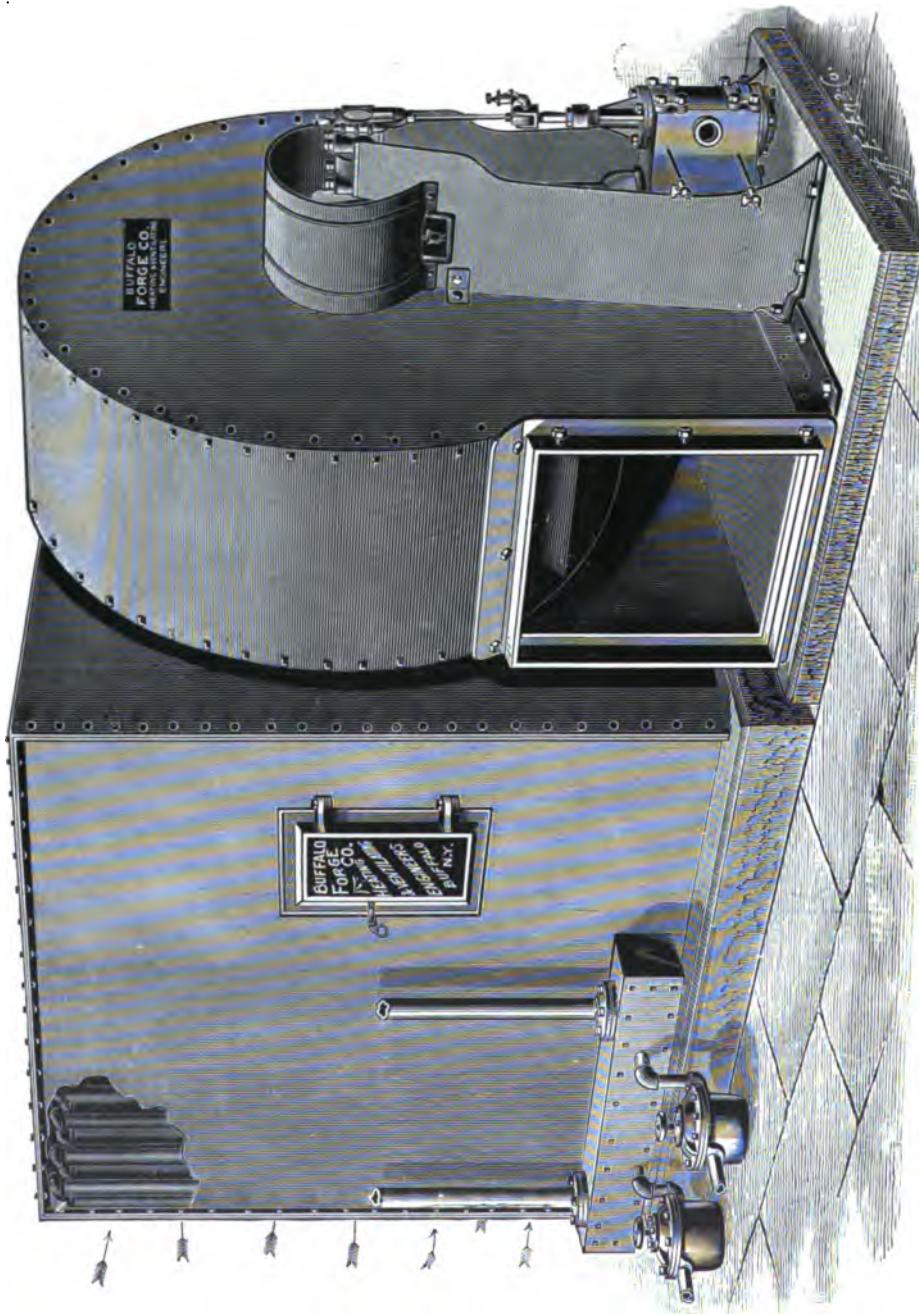
The most compact Buffalo Hot Blast Apparatus is secured when the fan is built as an exhauster, the outline of space occupied being more nearly square than when the fan blows through the heater. Broadly speaking, the relative position of a Hot Blast Apparatus to the space to be heated should be as central as is practicable. Then the arrangement of the conveying hot air pipes, or flues, will usually be the least complicated, and hence entail the smallest outlay in erecting. To secure a uniform distribution of air, however, this is not absolutely essential. Whenever it is not feasible to locate the apparatus centrally, the best results will generally be obtained by choosing such a position that the heated air, through the medium of well arranged distributing pipes, will constantly be forced by the fan toward the more exposed portions of the building.

When serving as a heating and ventilating outfit under conditions similar to those outlined above, the Buffalo Hot Blast Apparatus will usually assume and be furnished in the form illustrated by the engraving on the following page, arranged for the fan to handle the air hot, first drawing it through the heater. The discharge of the fan may be bottom horizontal, as shown, top horizontal, up blast, down blast, or with two outlets to deliver it in opposite directions, and either right or left hand, whichever will be best adapted to existing conditions. Fresh cold air enters the heating chamber after the manner indicated by the arrows in the engraving on page 54, then comes into the fan thoroughly heated, whence it is forced through the mains and branches to the outlets or registers.

The heater is of our standard construction, described in detail on page 63, and the fan and engines also are of our sole manufacture of the regular types fully referred to in the foregoing pages. Both bearings of the fan are upon the engine side, and the fan wheel is overhung. The inlet, therefore, is entirely unobstructed by the usual supports for the opposite bearing found in other apparatus, and consequently there are no journal boxes to give trouble by heating or any difficulty experienced in supplying with oil. The use of the Buffalo Self-contained Upright Engine, with its broad base and its shaft receiving the overhung fan wheel, ensures smooth running, where the types of engines furnished by other manufacturers would be utter failures, because of foundations having settled or otherwise becoming impaired. A substantial and well built foundation for a Hot Blast Heating Apparatus, as well as for any other machinery with rapidly moving parts, however, is always very desirable. In the Buffalo Hot Blast Apparatus, which alone embodies the above features of construction, the acme of convenience and efficiency is secured.

The heater shown is composed of four sections, each of which have four rows of pipes all independently bolted and connected to the steam inlet, or header, and drip. Live steam direct from the boilers, and exhaust steam from factory or mill engine, may be used together, or separately, as desired. The exhaust steam of the fan engine also is utilized in the heating surface. Positive circulation of steam and an easy flow of the condensation is attained in a degree of efficiency unequaled by any hot blast coil or radiator construction extant.

Buffalo Steam Hot Blast Apparatus.



Arranged for Low Pressure Steam and for Fan to Exhaust Through Heater.

Buffalo Steam Hot Blast Apparatus,

Full Housing Fans, Patented Sectional Base Heaters.

IN THE table appearing below, we give only the smallest and largest sizes of heaters used with each fan, omitting the intermediate ones, for the reason that too many arrangements are possible between these limits to describe in the space at command. To meet the varied requirements of heating and drying under all circumstances, which are not frequently identical in any two instances, it is absolutely necessary to have variable sizes of heaters at command. The sizes of engines, especially with the horizontal types, are also variable, the size selected for a certain fan being dependent upon the steam pressure carried. For these reasons, no complete list of prices can here be presented which would cover all requirements. These will be furnished on application when accompanied by a full description of the results which it is desired to secure.

Both Steam and Pulley Fans are used with standard heaters, and may be readily furnished in the full variety of discharges, as described and illustrated on previous pages.

EXHAUSTING THROUGH HEATER. HEIGHTS AND FLOOR SPACES.

STEAM FAN SIZE	HEATER CAPACITY IN SQUARE FEET HEATING SURFACE	EXTREME DIMENSIONS OF APPARATUS			WEIGHT OF AP- PARATUS		PRICE OF APPARATUS.	
		Length	Width	Height	With Steam Fan	With Pulley Fan	With Steam Fan	With Pulley Fan
3½ x 5 50 in.	576 1336	7 ft. 5 in. 8 " 10 "	5 ft. 0 in. 5 " 0 "	5 ft. 3 in. 5 " 9 "	2465 lbs. 4365 "	2315 lbs. 4215 "		
4 x 5 60 in.	864 1784	8 " 5 " 9 " 1½ "	5 " 9 " 6 " 2½ "	5 " 6½ " 5 " 9 "	3414 " 5714 "	3214 " 5514 "		
4½ x 7 70 in.	992 2376	8 " 3½ " 9 " 8½ "	6 " 7 " 6 " 7 "	6 " 4 " 7 " 3 "	4240 " 7700 "	3993 " 7453 "		
5½ x 7 80 in.	1488 2784	9 " 11½ " 10 " 8 "	7 " 2½ " 7 " 5½ "	6 " 8½ " 6 " 11½ "	5926 " 9166 "	5626 " 8866 "		
6 x 8 90 in.	2088 3024	10 " 6 " 11 " 2½ "	8 " 0 " 8 " 0 "	7 " 6 " 7 " 6 "	8050 " 10390 "	7552 " 9892 "		
6½ x 8 100 in.	2460 4700	10 " 11 " 12 " 10 "	8 " 8½ " 8 " 9 "	8 " 4 " 8 " 4 "	9520 " 15120 "	8870 " 14470 "		
6½ x 9 110 in.	3024 6072	12 " 5½ " 13 " 10½ "	9 " 6 " 9 " 6 "	9 " 2 " 9 " 2 "	11885 " 19505 "	11023 " 18643 "		
7 x 9 120 in.	3760 6072	12 " 10 " 14 " 3 "	10 " 2½ " 10 " 2½ "	10 " 0 " 10 " 0 "	14630 " 20440 "	13847 " 19627 "		
7½ x 9 130 in.	4048 6870	13 " 9½ " 15 " 2 "	11 " 0 " 11 " 0 "	10 " 10 " 10 " 10 "	16820 " 23875 "	15920 " 22975 "		
10 x 8 140 in.	4809 7730	15 " 3 " 16 " 6 "	11 " 9½ " 11 " 9½ "	11 " 8 " 11 " 8 "				
10 x 12 150 in.	5496 9276	16 " 6 " 18 " 2 "	12 " 6½ " 12 " 6½ "	12 " 6 " 12 " 6 "				

Buffalo Steam Hot Blast Apparatus.



Arranged for Low Pressure Steam, and for Fan to Blow Through Heater.

Buffalo Steam Hot Blast Apparatus,

Full Housing Fans, Patented Sectional Base Heaters.

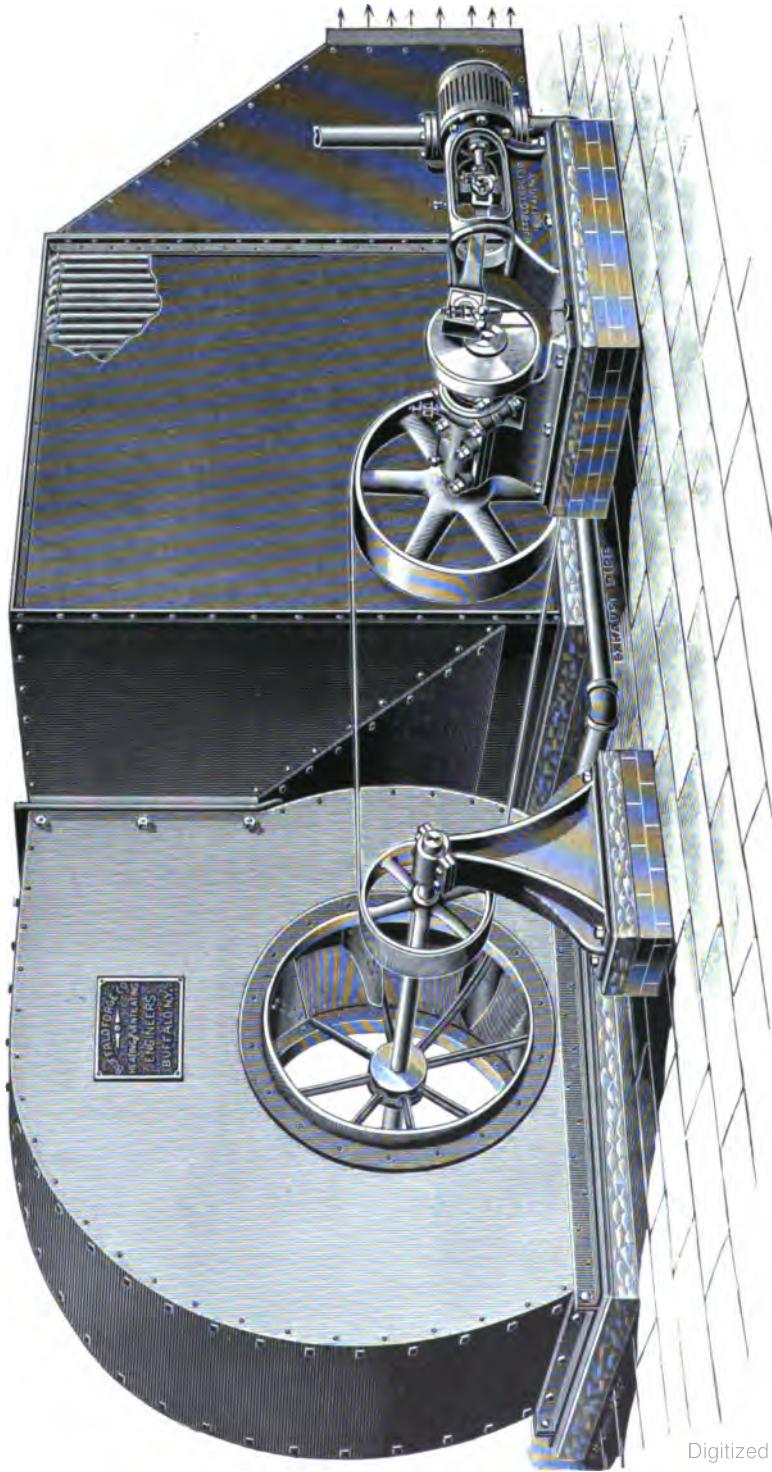
IN THE table appearing below, we give only the smallest and largest sizes of heaters used with each fan, omitting the intermediate ones, for the reason that too many arrangements are possible between these limits to describe in the space at command. To meet the varied requirements of heating and drying under all circumstances, which are not frequently identical in any two instances, it is absolutely necessary to have variable sizes of heaters at command. The sizes of engines, especially with the horizontal type, are also variable, the size selected for a certain fan being dependent upon the steam pressure carried. For these reasons, no complete list of prices can here be presented which would cover all requirements. These will be furnished on application when accompanied by a full description of the results which it is desired to secure.

Both Steam and Pulley Fans are used with standard heaters, and may be readily furnished in the full variety of discharges as described and illustrated on previous pages.

BLOWING THROUGH HEATER. HEIGHTS AND FLOOR SPACES.

STEAM FAN SIZE	HEATER CAPACITY IN SQUARE FEET HEATING SURFACE	EXTREME DIMENSIONS OF APPARATUS			WEIGHT OF AP- PARATUS		PRICE OF APPARATUS	
		Length	Width	Height	With Steam Fan	With Pulley Fan	With Steam Fan	With Pulley Fan
3½ x 5 50 in.	578 1336	8 ft. 7½ in. 9 " 11 "	4 ft. 5½ in. 4 " 5½ "	5 ft. 3 in. 5 " 9 "	2465 lbs. 4365 "	2315 lbs. 4215 "		
4 x 5 60 in.	864 1784	10 " 0 " 10 " 8½ "	4 " 10 " 5 " 9 "	5 " 10½ " 5 " 10½ "	3414 " 5714 "	3214 " 5514 "		
4½ x 7 70 in.	992 2376	10 " 1½ " 11 " 5 "	5 " 9½ " 5 " 9½ "	6 " 8½ " 7 " 3 "	4240 " 7700 "	3993 " 7453 "		
5½ x 7 80 in.	1488 2784	11 " 5½ " 12 " 8 "	5 " 11 " 6 " 9 "	7 " 6½ " 7 " 6½ "	5926 " 9166 "	5626 " 8866 "		
6 x 8 90 in.	2088 3024	12 " 9 " 13 " 5½ "	6 " 9½ " 6 " 9½ "	8 " 4 " 8 " 4 "	8050 " 10390 "	7552 " 9892 "		
6½ x 8 100 in.	2460 4700	13 " 5½ " 14 " 10½ "	7 " 2 " 7 " 8 "	9 " 13 " 9 " 13 "	9520 " 15120 "	8870 " 14470 "		
6½ x 9 110 in.	3024 6072	14 " 11½ " 16 " 4½ "	7 " 2 " 7 " 8 "	9 " 11½ " 9 " 11½ "	11885 " 19505 "	11023 " 18643 "		
7 x 9 120 in.	3760 6072	15 " 8 " 17 " 1 "	7 " 11 " 7 " 11 "	10 " 9½ " 10 " 9½ "	14660 " 20440 "	13847 " 19627 "		
7½ x 9 130 in.	4048 6870	16 " 11½ " 18 " 4 "	8 " 1 " 8 " 8 "	11 " 7 " 11 " 7 "	16820 " 23875 "	15920 " 22975 "		
10 x 8 140 in.	4809 7730	17 " 10½ " 19 " 12 "	9 " 9 " 9 " 9 "	12 " 4½ " 12 " 4½ "				
10 x 12 150 in.	5496 9276	19 " 1 " 20 " 9 "	10 " 5 " 10 " 5 "	13 " 2½ " 13 " 2½ "				

Buffalo Steam Hot Blast Apparatus.



Three-quarter Housing Fan, Blowing Through Heater, Driven by Buffalo Self-contained Horizontal Engine.

Buffalo Steam Hot Blast Apparatus,

Blowing Through Heater, See Page 58.

IN MANY cases of application of the Buffalo Hot Blast System to hospitals, sanitariums, public schools and the like, it is extremely desirable, aside from the heating of the building, to have under perfect control a method of supplying each room with cold fresh air as well. In the example of hospitals, where patients are confined in individual rooms with diseases of a widely different nature, this point is very necessary, if the heating and ventilating system is to be a perfect one. It is for the heating and ventilation of such buildings, under the conditions referred to, that the blow-through type of apparatus excels. A double system of air ducts is constructed, the cold air being forced through one system, and hot air through the other. The cold air supply is taken either direct from the fan or from the chamber between it and the heater, while the hot air flues connect directly with the outlets from the heater case.

For many of the drying uses to which the Buffalo Hot Blast Apparatus has been adapted with eminently successful results, the blow-through form is the only one which possibly could accomplish the desired end. As these drying schemes are widely different in character, according to the nature of the material to be handled, the apparatus is invariably of special construction with reference to the relative proportions of the fan and the heater. In one example, a small heater with a proportionately larger fan may be selected, while in another, directly the reverse would be employed.

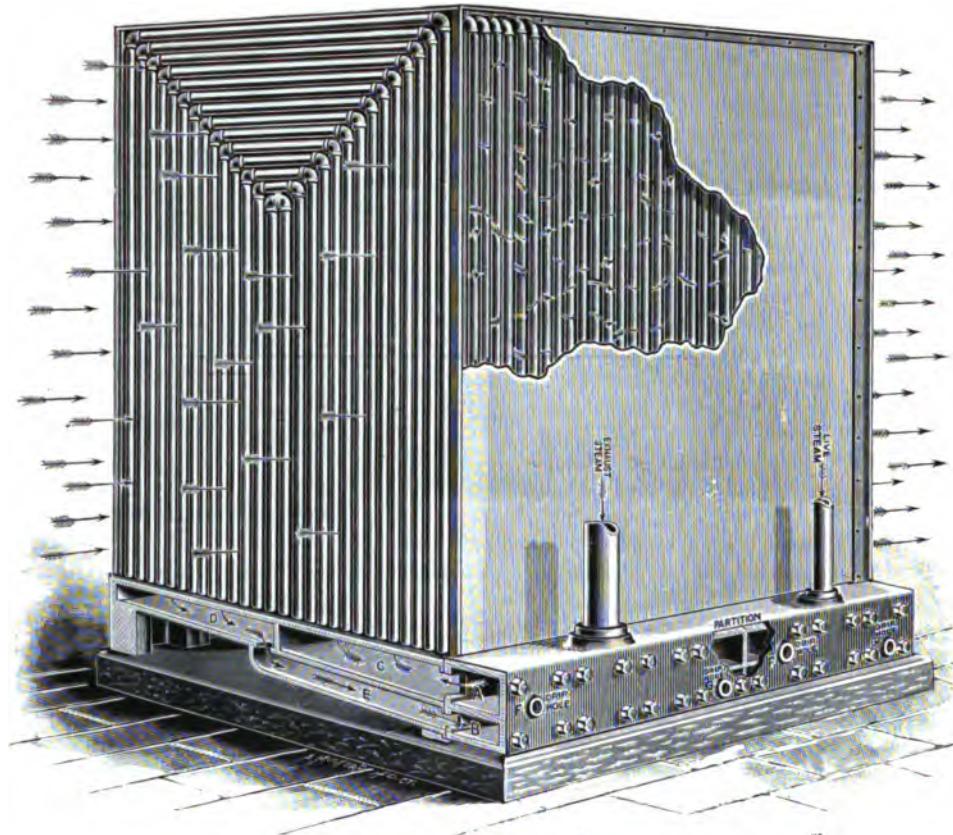
The contour of space occupied by Buffalo Hot Blast Apparatus, arranged to blow through the heater, is long and narrow, or more like that of a parallelogram than the other type. In the erection of these outfitts for the heating and ventilation of various buildings, it often occurs that the position assigned for the apparatus is of such shape that it is imperative the plant be constructed in the blow-through form to accommodate itself to the space at command. Where a pulley fan is selected in the place of an engine fan, a blow-through apparatus will frequently be the only one which it would be feasible to adopt on account of complicated power transmissions ensuing if the other form of apparatus were chosen.

The engraving on page 58 shows a bottom discharge fan with top outlet to the heater, which is the style of apparatus ordinarily used where the outfit is located in the basement of a building, and the distributing flues lead directly upward. The illustration on page 60 is taken from an apparatus located at some distance from the point where the flues rise to the various apartments to be heated, and where it was desirable, to prevent the obstruction of valuable space, to carry an underground duct leading thereto. At whichever point it is desired to take the air from the heater, the discharge of the fan is made so as to cause a most thorough circulation of the air when passing through it, and by thus securing a thorough diffusion of the air over the heating surface, it reaches the highest possible temperature. The outlet from the heater may be located in almost any position, discharging either directly upward, outward, downward, to the right or left, or in two or more directions.

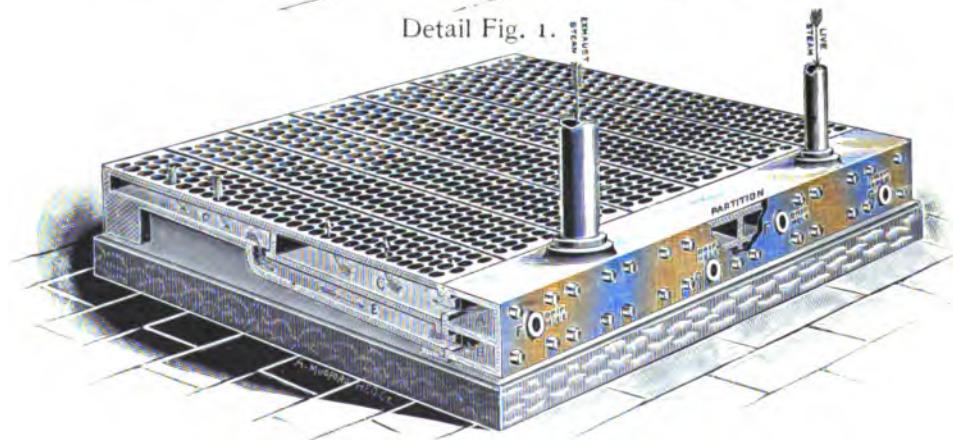
The apparatus shown on the opposite page is of the same regular construction herein described, the heater containing an equal number of sections to the one illustrated on page 58. All Buffalo Hot Blast Heaters, excepting the very small apparatus, are built to use live steam direct from boilers, and exhaust steam from the mill and fan engines, all at will of operator. The coils are constructed in both two and four row sections, and a heater for drying or heating work may consist of any number required to accomplish a given service. The manifold bases are built in different lengths, and the height of pipes also is varied to harmonize therewith, and also with the size of fan in conjunction with which it is to operate.

All Buffalo Hot Blast Apparatus are of the highest standard of utility. They are economical in steam consumption, and condense all there is supplied before it is allowed to escape. Every heat unit in live and exhaust steam is utilized to the greatest advantage.

Buffalo Patented Steam Hot Blast Heater, Steel Pipe, Sectional Bases, Positive Steam Circulation and Condensation Drainage.



Detail Fig. 1.



Detail Fig. 2.

Unique in the Feature of Positive Steam Circulation and Condensation Drainage,

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Buffalo Patented Steam Hot Blast Heaters,

Steel Pipe, Sectional Bases, Positive Steam Circulation and Condensation Drainage.

THE heater herewith defined possesses the highest standard of utility. In a Hot Blast Heater, the highest standard of utility means a *forced* circulation of steam, and a *positive* and *easy* drainage of water of condensation. Obviously, this yields the highest possible temperature to be derived from the heat units of both live and exhaust steam. This matchless heater, fully covered by letters patent, is herewith presented as being by far the most perfect in design and construction of any yet offered.

As will be observed by a careful investigation of the detailed engravings, established laws have been followed in design; therefore, results hitherto unattained are secured. The heater proper consists of two distinct portions, the header or steam supply, and several manifolds or sectional bases.

THE HEADER OR STEAM SUPPLY has two compartments, A and B. With the exception of heaters of unusual size, one common header is used for the entire group of sections. Compartment A is the chamber into which steam is admitted, and through which it passes to compartment C of each manifold in supplying the heating surface. The condensation accumulating in compartment C of manifold passes to compartment A of header and thence through the drip F into the trap. Compartment B of the header, as is clearly shown, is directly underneath the steam supply. Through it passes all the water of condensation coming from compartments D and E of the manifolds, thence through G into another trap.

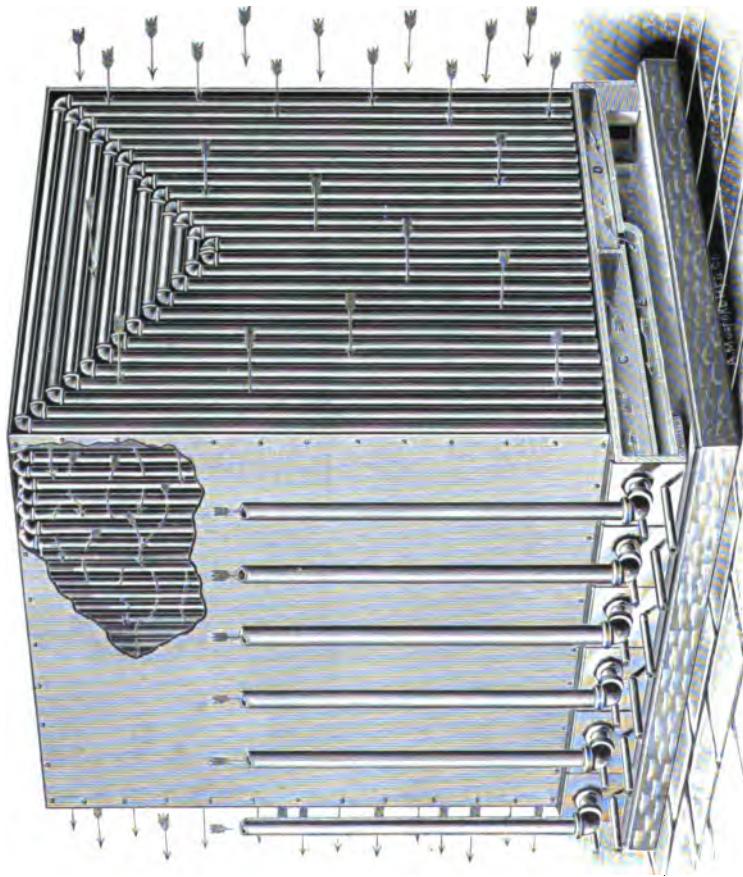
THE MANIFOLD OR SECTIONAL BASES have three distinctive compartments, C, D and E, each of ample area for the specific purpose for which they are intended to serve. From A, in the steam supply or header, steam is admitted to the manifolds through chamber C, and thence passes up through the vertical pipes to and across the horizontal pipes at top of heater, and thence down the vertical pipes at opposite side, all as indicated by the arrows. Out of the manifold compartment D, the water of condensation flows through E into header chamber B, from whence it is removed through the drip G into the trap. As the engraving clearly illustrates, the water of condensation has a rapid and easy flow to the exits provided, which are of ample area. This flow is accelerated by the inclined bottoms of the manifolds. As will readily be seen, *the use of the two drips positively ensures dry steam in every portion of the heater at all times. These distinctive characteristics are found in no other construction of heater, and enable us to guarantee a temperature of from 15 to 25 per cent higher than can be obtained from any other heater.* Each coil contains two or four rows of vertical pipes, as required, connected at the top by cross pipes. These sections are built of various heights, as may be best adapted to any purpose for which they are to be used, and in different lengths of bases of from 3 to 7 feet. In the larger heaters, the coils are usually furnished in the two-row form to avoid unwieldiness and excessive weight. The steel pipes are screwed into the cast iron bases in such a manner as to allow free expansion and without endangering the joints and inducing leaks incident to the employment of return bends, which are not used in this heater. Each manifold, which is of ample thickness, is planed on the ends, so that when bolted to the planed surface of the header an accurate fit is secured.

With many heaters, long through bolts are employed, which reach entirely through all of the sections for the purpose of holding them together. An endless amount of trouble is often experienced in keeping such heaters steam-tight. The sections are not independent, and a leak is liable to occur between any of the bases, when the tedious operation of taking apart the entire heater is occasioned. Furthermore, it is a difficult task to draw these bolts up sufficiently tight to prevent the escape of steam, and the threads often become cut, necessitating new bolts. In the Buffalo Improved Heater, every section is independent and has a separate connection to the header or steam supply. If any section should become damaged, or leakage occur at the joints, it may be removed without disturbing any of the others, and by capping the connection to the Header, the balance of the heater may be operated while repairs are being made.

Buffalo Improved Hot Blast Heaters are arranged to use live and exhaust steam at the same time, or either all exhaust or all live, as desired. Each heater is thoroughly tested under a hydrostatic pressure of 200 pounds per square inch before leaving the works, ensuring tightness and perfect freedom from flows.

Buffalo Patented Steam Hot Blast Coils,

Steel Pipe, Sectional Bases, Positive Steam Circulation and Condensation Drainage.



Detail Fig. 1.

Detail Fig. 2.

Furnished in Two or Four Row Sections, with or without Steel Plate Jacket.

Buffalo Patented Steam Hot Blast Coils,

Steel Pipe Sectional Bases, Positive Steam Circulation and Condensation Drainage.

A HEATER composed of a number of sections of the design illustrated on the opposite page, is identical and of equal efficiency with the regular Buffalo Patented Steam Hot Blast Heaters, described and illustrated on pages 62 and 63, with the exception that the coils are furnished without the header or steam supply. Frequently, it occurs in the erection of Hot Blast Heaters that coils have to be set in large brick ducts, without other housing than the flue itself, and they are also used in conjunction with Buffalo Fan Wheels built into housings of wood or brick. In heating and ventilating systems, where the fan and heating surface are located at different points, and where coils are placed at the base of the flues, or not massed at a given point, the merit of this form of coil construction is unsurpassed.

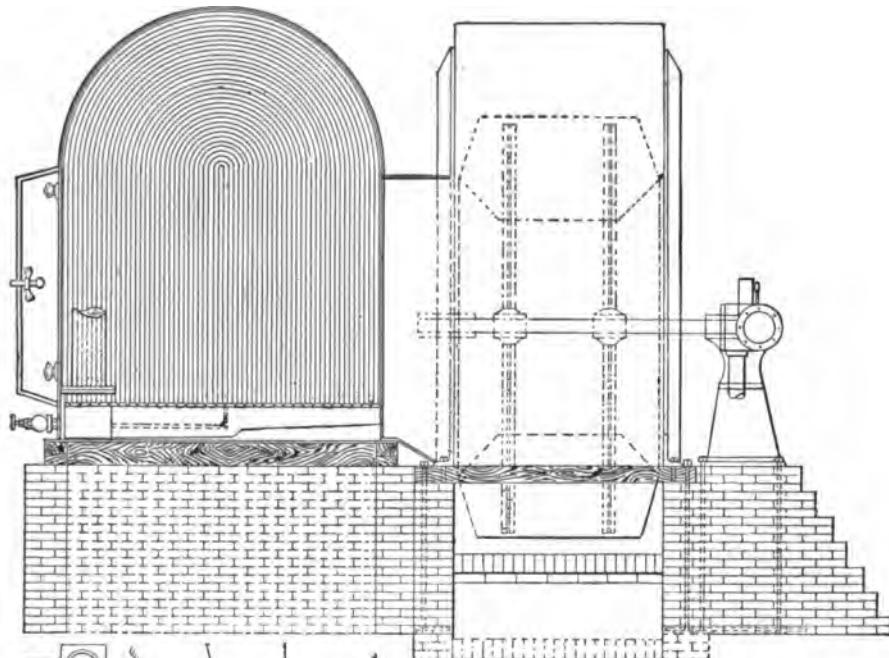
Under all the above conditions, it is undesirable, on account of the difficulty of access, to have a steam supply cylinder or header connected directly to the coils, and inside of such ducts or brick housing. To overcome these obstacles, and still render the Buffalo Hot Blast System feasible for all locations, the coils may be readily supplied as illustrated, without headers or the usual steel plate housings. All connections to the coils are exceedingly simple, and, each being independent of the other, there is no danger of leakage, as their tightness is insured before leaving the works, each coil being subjected to the same test as the standard heaters. It is possible to so arrange the steam connections that any desired number of the coils may be operated at will, for live or exhaust steam.

PRICE LIST, SIZES AND DIMENSIONS OF STANDARD SINGLE MANIFOLD SECTIONS.

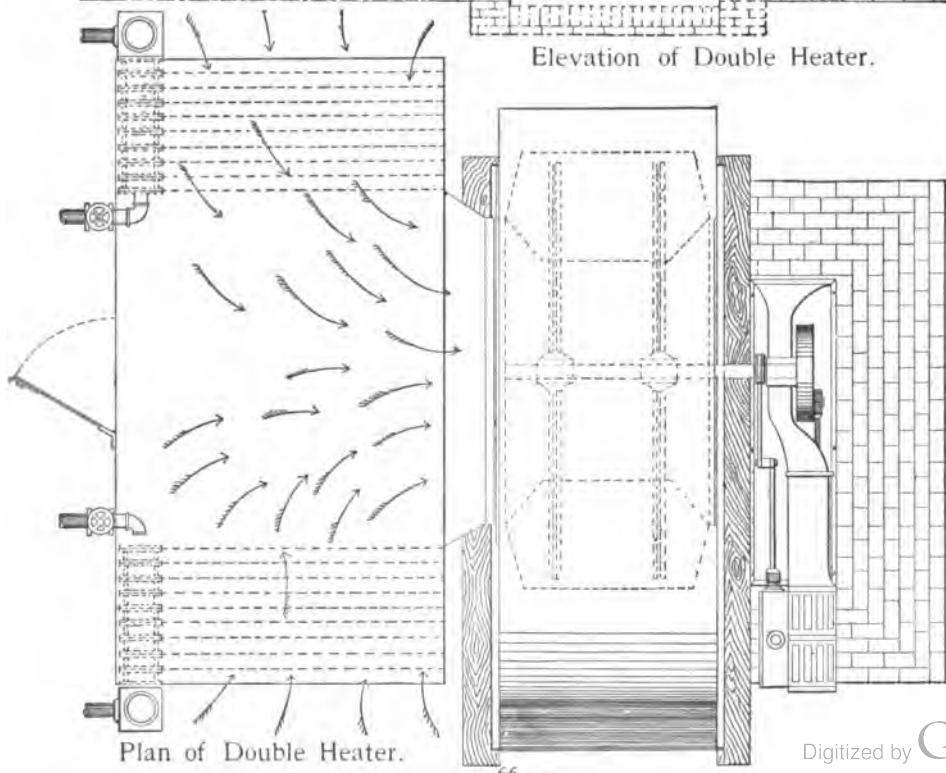
LENGTH OF SECTION	WIDTH OF SECTION		CAPACITY IN SQUARE FEET HEATING SURFACE PER SECTION		EXTREME HEIGHT OF HEATER	WEIGHT		PRICE WITHOUT HEADER	
	Two Rows	Four Rows	Two Rows	Four Rows		Two Rows	Four Rows	With Case	Without Case
3 ft.	4 $\frac{1}{2}$ in.	8 $\frac{1}{2}$ in.	139	277	4 ft. 4 in.	312 lbs.	623 lbs.		
			158	317	4 " 10 "	355 "	713 "		
			178	356	5 " 4 "	400 "	801 "		
4 "	4 $\frac{1}{2}$ "	8 $\frac{1}{2}$ "	198	396	5 " 10 "	445 "	891 "		
			245	490	5 " 4 "	551 "	1102 "		
			273	546	5 " 10 "	614 "	1228 "		
5 "	4 $\frac{1}{2}$ "	8 $\frac{1}{2}$ "	299	598	6 " 4 "	672 "	1345 "		
			327	654	6 " 10 "	735 "	1471 "		
			383	766	6 " 4 "	861 "	1723 "		
6 "	4 $\frac{1}{2}$ "	8 $\frac{1}{2}$ "	416	832	6 " 10 "	936 "	1872 "		
			451	902	7 " 4 "	1014 "	2029 "		
			486	972	7 " 10 "	1093 "	2187 "		
7 "	4 $\frac{1}{2}$ "	8 $\frac{1}{2}$ "	517	1034	7 " 4 "	1163 "	2326 "		
			556	1112	7 " 10 "	1251 "	2502 "		
			596	1192	8 " 4 "	1341 "	2682 "		
8 "	4 $\frac{1}{2}$ "	8 $\frac{1}{2}$ "	635	1270	8 " 10 "	1428 "	2857 "		
			709	1418	8 " 4 "	1595 "	3190 "		
			756	1512	8 " 10 "	1701 "	3402 "		
9 "	4 $\frac{1}{2}$ "	8 $\frac{1}{2}$ "	803	1606	9 " 4 "	1806 "	3613 "		
			850	1700	9 " 10 "	1912 "	3825 "		

Note—The full face figures in above table indicate the details of the regular standard coils which are constantly carried in stock. The other figures show the variations of heater heights on the same sizes of manifold bases which may be furnished.

Buffalo Steam Hot Blast Apparatus.



Elevation of Double Heater.



Plan of Double Heater.

Buffalo Steam Hot Blast Apparatus,

Three-quarter Steel Plate Housing Fans, Patented Sectional Base Heaters.

FOR the sake of reducing to a minimum the space occupied, and for convenience in operation, very extensive apparatus are built with Three-quarter Housing Exhaust Fans, and draw the air over the coils.

In this type, the heaters may then be composed of one, two or three groups, or more when duplex fans are employed, this being governed by the work to be performed, and the space at command for the location of the apparatus. We publish but one table of general dimensions of the Three-quarter Housing Fans and Heaters, omitting the Blow-through type, because not frequently used in extremely large arrangements. Where space for the apparatus is not confined to any given dimensions, equally good results may be obtained by blowing through the heater, and for certain drying uses it is far preferable to exhausting; therefore, for outfits requiring special treatment of this nature, complete detailed dimensions and contour of space occupied will be supplied.

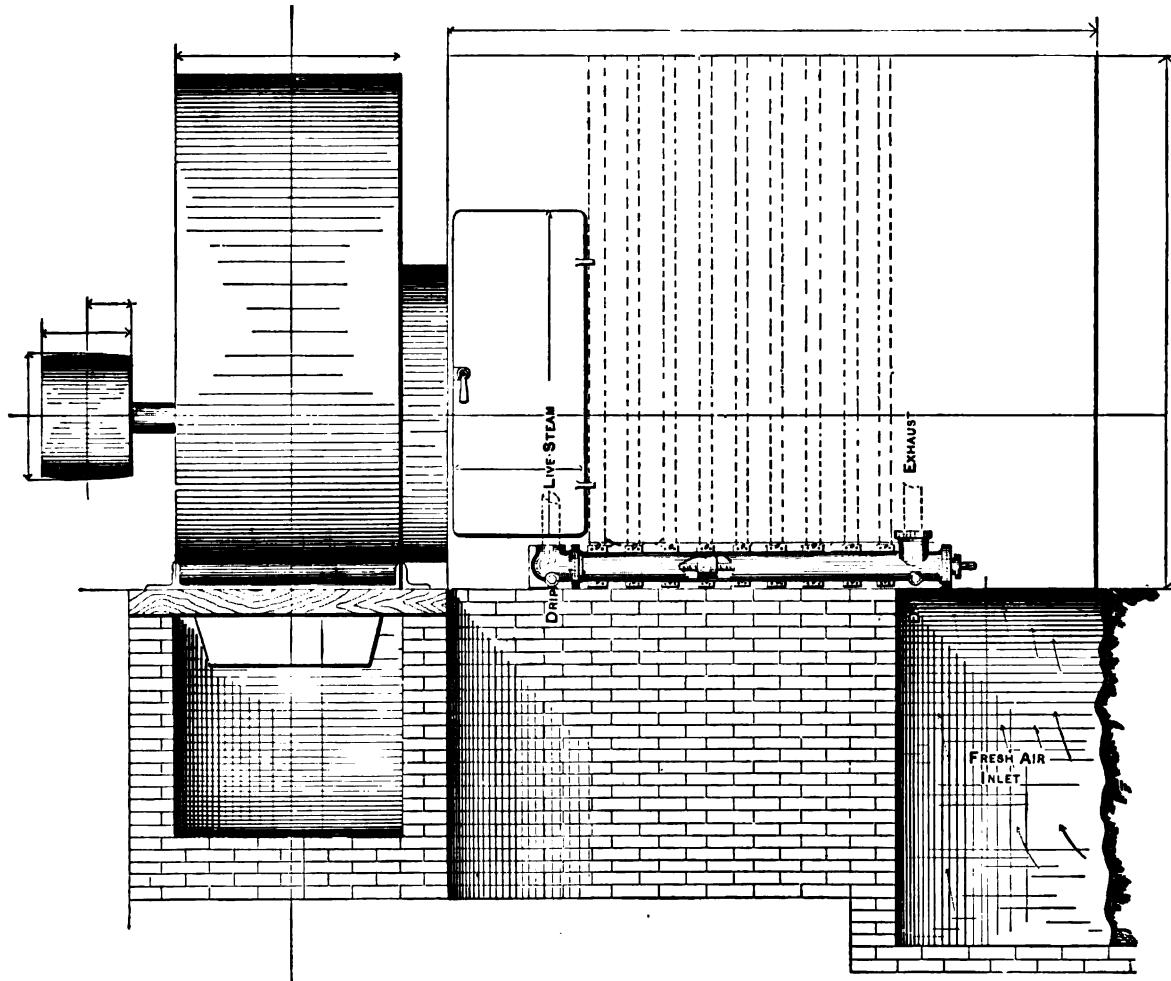
The table gives the smallest and largest heaters used with each fan only, omitting intermediate ones, as too many arrangements are possible between these limits to describe in the space at command. The sizes of engines are also variable, dependent upon the steam pressure carried. Both Steam and Pulley Fans are used with standard heaters, and may be readily furnished in the variety of discharges common to Three-quarter Housing Fans, illustrated and described on previous pages.

EXHAUSTING THROUGH HEATER. HEIGHTS AND FLOOR SPACES.

SIZE OF STEAM FAN	HEATER CAPACITY IN SQUARE FEET HEATING SURFACE	EXTREME DIMENSIONS OF APPARATUS			WEIGHT OF AP- PARATUS		PRICE OF APPARATUS	
		Length	Width	Height	With Steam Fan	With Pulley Fan	With Steam Fan	With Pulley Fan
110 in. 6 x 8	3280 5304	11 ft. 11 in. 13 " 6 "	8 ft. 5½ in. 8 " 5½ "	7 ft. 5 in. 7 " 11 "	10480 14528	9760 13808		
120 in. 6½ x 8½	3760 6072	12 " 7 " 14 " 1 "	9 " 3 " 9 " 3 "	7 " 5 " 7 " 11 "	12145 16769	11520 16144		
130 in. 8 x 8	3870 6183	13 " 0 " 14 " 3 "	10 " 0 " 10 " 0 "	7 " 10 " 8 " 11 "	14265 18891	13040 17668		
140 in. 10 x 8	4578 8030	13 " 9 " 15 " 8½ "	10 " 9 " 10 " 9½ "	8 " 5 " 9 " 5 "	16476 23380	16156 23060		
150 in. 10 x 12	6450 9490	16 " 11 " 18 " 3 "	11 " 7 " 11 " 7 "	9 " 0 " 9 " 5 "	23030 29110	21000 27080		
160 in. 12 x 12	8244 11595	18 " 6 " 19 " 3 "	12 " 4 " 12 " 4 "	9 " 8 " 9 " 11 "	27308 34010	25808 32510		
170 in. 12 x 14	9618 13914	20 " 4 " 22 " 2 "	13 " 1 " 13 " 1 "	10 " 3 " 10 " 3 "	32036 40628	29536 38128		
180 in. 14 x 14	11680 16460	21 " 4 " 22 " 10 "	13 " 11 " 13 " 11 "	10 " 10 " 10 " 10 "	38060 47620	35060 44620		

Buffalo Steam Hot Blast Apparatus,

Special Arrangements.



Apparatus Arranged to Exhaust Through the Heater. Intake of Air from Underground Duct Leading to Outside. Three-quarter Housing Pulley Fan Discharging Heated Air into Underground Main Flue.

Buffalo Steam Hot Blast Apparatus,

Special Arrangement of Heaters.

INDEPENDENT ENGINES BELTED TO FAN.—Cases frequently occur in the introduction and erection of Buffalo Hot Blast Apparatus, where it is desired to drive the fan by an Independent Self-contained Engine, conveniently located, instead of employing the usual method of Direct Acting Engines attached to the fan shaft. This arrangement is especially commendable in large heating plants for audience or legislative buildings, for the reason that the average engineer employed for the care of such plants better understands the adjusting and care of an engine of this type, than where it is a part of the fan itself; therefore, this form ensures the most quiet performance of the heating outfit. An arrangement of this nature is illustrated by the engraving on page 60. Where there is other light machinery to be driven by the same engine that runs the fans, the feature of having an engine independent is also valuable, as it is generally an easy task to transmit power thereto.

In many structures, the arrangement of the hot air and ventilating flues is often such that the use of an eduction fan is made necessary on account of its being difficult to derive a sufficient natural escape of foul air through the flues provided for that purpose, as laid out. This fan can usually be so located as to connect with the various foul air flues, and also receive its transmission of power from the same engine as drives the heating fan; thus the cost of a second engine is saved.

THREE-QUARTER HOUSING STEAM FAN, AND TWO-DIVISION HEATER.—The outline cuts appearing on page 66 illustrate a very convenient form of arranging large heating plants, where the height for the required fan capacity is limited. As the illustration readily suggests, there are further points of merit embodied in a heating plant thus planned. The heater is constructed in two groups, and offers a large area for the admission of air to the fan. In moderate weather, steam may be turned entirely off one group, and often the *exhaust* steam therein will be sufficient to do the heating. By a proper manipulation of the dampers provided, cold air may be drawn through the coils not filled with steam, and mixed with the heated air from the other portion of heater. Intelligent regulation of the dampers will give the desired temperature. Directly opposite the inlet to fan, as will be observed by the plan view, a large damper or door is provided in the heater housing, which is of sufficient area to supply the fan with its full capacity of air. When the fan is run solely for ventilating and to its full capacity, a good example being during a summer theatrical performance, this makes a very convenient arrangement.

Quite often, the heaters are built in triple form, the third portion being placed where the large door is shown opposite to the inlet of the fan. Each component part of the apparatus is arranged symmetrically, securing a uniform velocity and even temperature of the air delivered by the fan.

Where the height allotted for the apparatus is so limited as to preclude the possibility of one fan accomplishing the work, double fans are placed side by side in connection with double or triple heaters, as the case may necessitate. The usual discharge of the fans is either bottom horizontal or top horizontal, though sometimes up-blast. The shafts of the fan may be coupled together, and if the engines be direct attached, one of them would easily drive both blowers at a moderate speed, while both engines may be readily thrown into operation when required to run the apparatus to its capacity. The fans, when adapted to the above conditions, invariably assume the exhaust type, drawing the air through the heater and delivering it hot to the ducts.

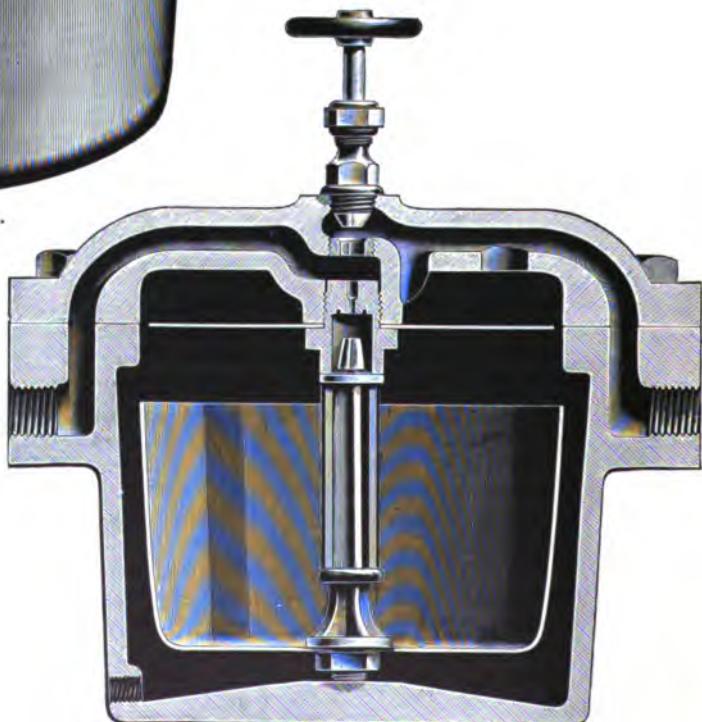
The illustration on page 68 shows a large Buffalo Hot Blast Heating Apparatus, designed to consume the least possible amount of space. Fresh air is supplied to the outfit through an underground duct leading underneath the wall of the structure to the outside, and after passing through the heater and fan, is delivered into the main flue, also underground, from which is taken the various off-shutes or branches conveying the hot air to the desired points.

Special arrangements of Buffalo Hot Blast Apparatus either with pulley or engine fans can readily be designed, which will adapt the system to any existing conditions.

Buffalo Improved Steam Traps.



Exterior View.



Sectional View.
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Buffalo Improved Steam Trap.

A THOROUGHLY reliable and efficient Receiving Steam Trap is a most important adjunct to a Buffalo Hot Blast Apparatus. To the economical and continuous working of any heating plant, it is essential that the water of condensation be either returned directly to the boilers, or constantly withdrawn by the aid of some device, which, while allowing the free discharge of water, will prevent the escape or loss of steam. The action and construction of the Buffalo Improved Steam Trap for this service is made clearly apparent by the cuts which appear on the opposite page. Ordinary receiving steam traps are not well suited for removing the water of condensation from Buffalo Hot Blast Heaters, inasmuch as the condensation of steam in these coils is very rapid, and the amount of water discharged from a given number of feet of lineal 1-inch pipe is three-fold as great as from direct heating coils.

As will be observed by the sectional view, this trap possesses peculiar and valuable features found in no other construction. The float valve and its attachments are placed near to the top of the float, where they are removed, as far as possible, from such particles of dirt, red lead, scales, etc., as commonly become detached from boilers and the coils, and, with the flow of the condensation, readily find their way into the steam trap. In some constructions of traps, this float valve with its attachments are located at the bottom of the float, at which point they invite the collection of sediment, with the attendant result of rendering the trap inoperative, and necessitating the frequent taking apart to remove the obstruction. A trap of this construction, for use in conjunction with a Hot Blast Apparatus, is an abomination. The improvements embodied in the present trap have been the outcome of familiarity with the liabilities to derangement to which steam traps are peculiarly exposed. They are the standard of excellence.

The largest sizes of Buffalo Steam Traps are provided with a small cover or hand-hole, which may readily be detached for the purpose of inspecting the working parts, or removal of accumulations, thus avoiding the usual and tedious alternative of taking off the whole top of the trap, common to other forms of trap construction.

Though these traps are especially adapted for use in conjunction with Buffalo Hot Blast Heaters, their prominent points of merit readily recommend them for service on any arrangement which requires the removal of water of condensation. The action of the Buffalo Improved Steam Trap is entirely automatic. The discharge or delivery is periodic, dependent upon the amount of condensation of the coil, and continues as long as there is water to be discharged.

A large assortment of the various sizes is kept constantly on hand, and orders can be filled without delay. When traps are ordered separately from Buffalo Hot Blast Apparatus, if the steam pressure is in excess of 80 pounds, it should be so stated, that they may be properly adjusted to it.

SIZES, CAPACITIES AND PRICES.

NO. OF STEAM TRAP	SIZE OF PIPE CONNEC- TIONS	DIAMETER OUTSIDE OF FLANGES	DIAMETER OF CYLINDER	HEIGHT TO TOP OF VALVE	HEIGHT TO TOP OF COVER	MAXIMUM DIS. LBS. PER MINUTE	AMOUNT MAX. BUFFALO HOT BLAST HEAT- ING SURFACE	MAXIMUM AMOUNT OF LINEAL FT. 1 IN. PIPE	PRICE
1	$\frac{1}{2}$	10 $\frac{1}{4}$	8	11	8	2	350	1050	\$16.00
2	$\frac{3}{4}$	14 $\frac{1}{4}$	10 $\frac{1}{2}$	14	10	5	900	2700	22.00
3	1	15 $\frac{1}{4}$	12	16 $\frac{1}{4}$	12	8	1400	4200	27.50
4	1 $\frac{1}{2}$	19	14	18 $\frac{1}{2}$	14	12	2000	6000	42.50
5	1 $\frac{1}{2}$	24 $\frac{1}{4}$	18	23 $\frac{1}{2}$	15 $\frac{1}{2}$	20	3500	10500	70.00

Buffalo Hot Blast System of Heating and Ventilating.

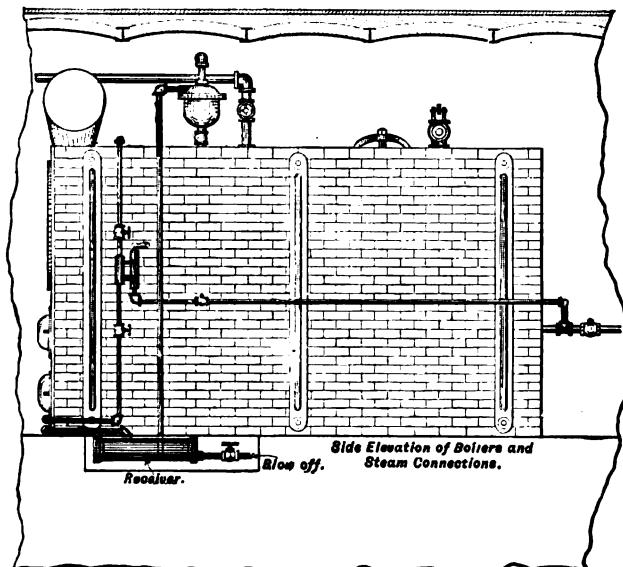


The Central Savings Bank, Canton, Ohio.

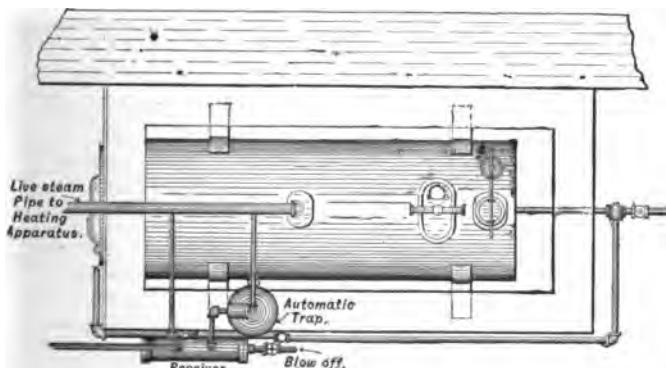
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Buffalo Hot Blast System of Heating and Ventilating.

OUTSIDE of an extremely large volume, it would be impossible to describe at length the Buffalo Hot Blast System of Heating and Ventilation, as applied to the multitude of buildings of various types and for the diversified uses to which it has been adapted with gratifying results exceeding those of any other apparatus. In the succeeding pages, the end sought is simply to give a comprehensive idea of the system, and the general points to be met with in its introduction and installation. The few illustrations appearing herewith were selected with care, to the end of portraying the more common forms of application in as many different types of building construction as are referred to.



Central Savings Bank. Detail Fig. 2.



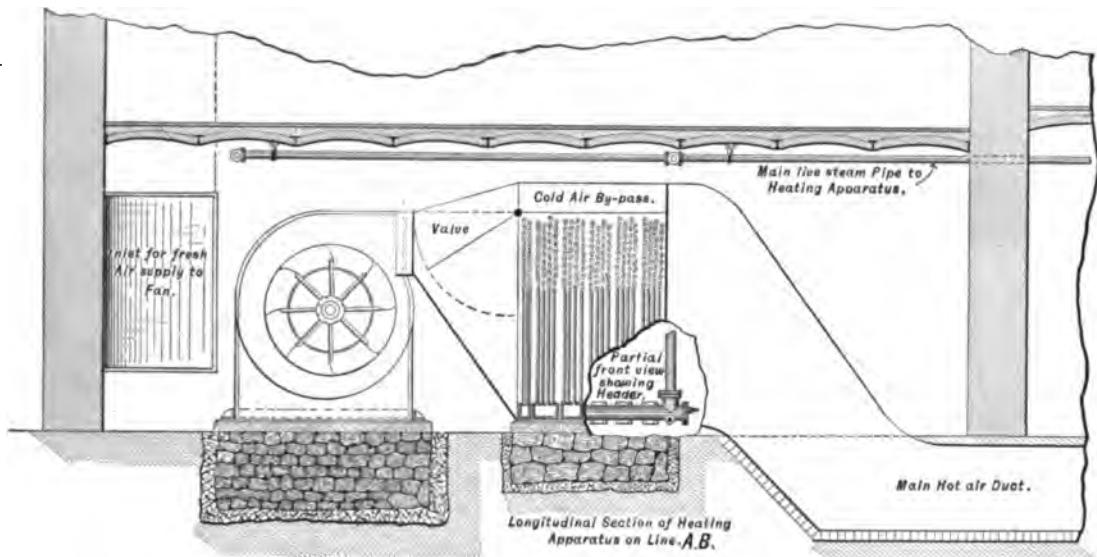
Central Savings Bank. Detail Fig. 3.

Buffalo Hot Blast outfits have been installed in thousands of buildings throughout the country, covering commercial, legislative and entertainment types. By these, we mean banks, stores, office buildings, training schools, hospitals, hotels, opera houses, theatres, halls of audience, colleges, sanitaria, asylums, power buildings, factories and manufacturing establishments in endless variety, paper, pulp, cotton, woolen, silk mills, etc. The Buffalo Hot Blast Apparatus is also being extensively introduced for the warming and ventilation of the larger ocean steamships with unparalleled success. On application, we will be pleased to forward blue prints of existing outfits not embodied or described in the accompanying pages, showing the detailed arrangements of plants for any special kind of building, and to make plans of application with estimates of cost for any desired purpose.

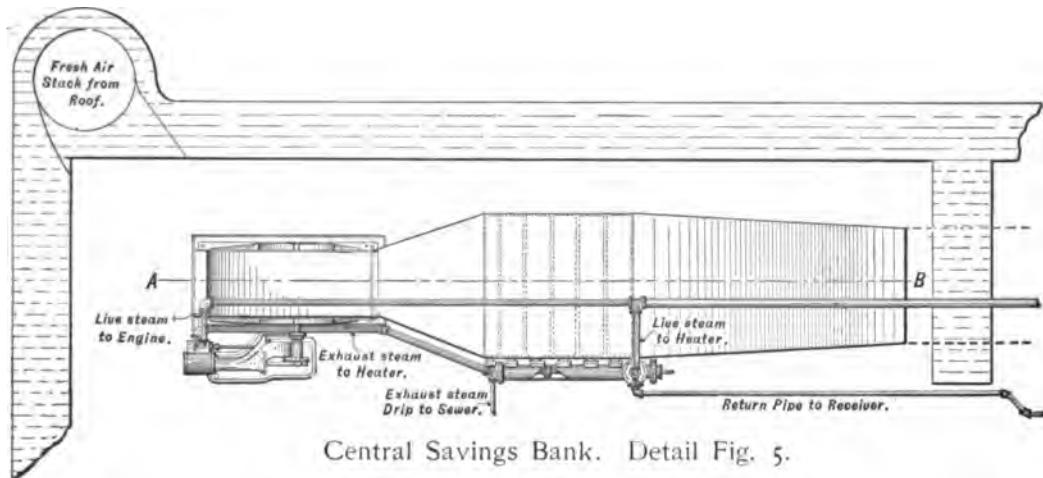
THE CENTRAL SAVINGS BANK.

The first structure referred to is a bank building, the Central Savings Bank, Canton, O., Guy Tilden, architect. The half-tone reproduction is, of course, a correct representation of the building, and portrays a structural outline often met with, i. e., comparatively narrow and of moderate size. The lower portions are used for the general business of the bank, while the upper stories are devoted to offices laid out in apartments of suitable dimensions to meet the requirements of tenants. The building contains cubical contents of 259,000 feet, the conditions of exposure being well shown in the illustration. The boiler is

Buffalo Hot Blast System of Heating and Ventilating.



Central Savings Bank. Detail Fig. 4.

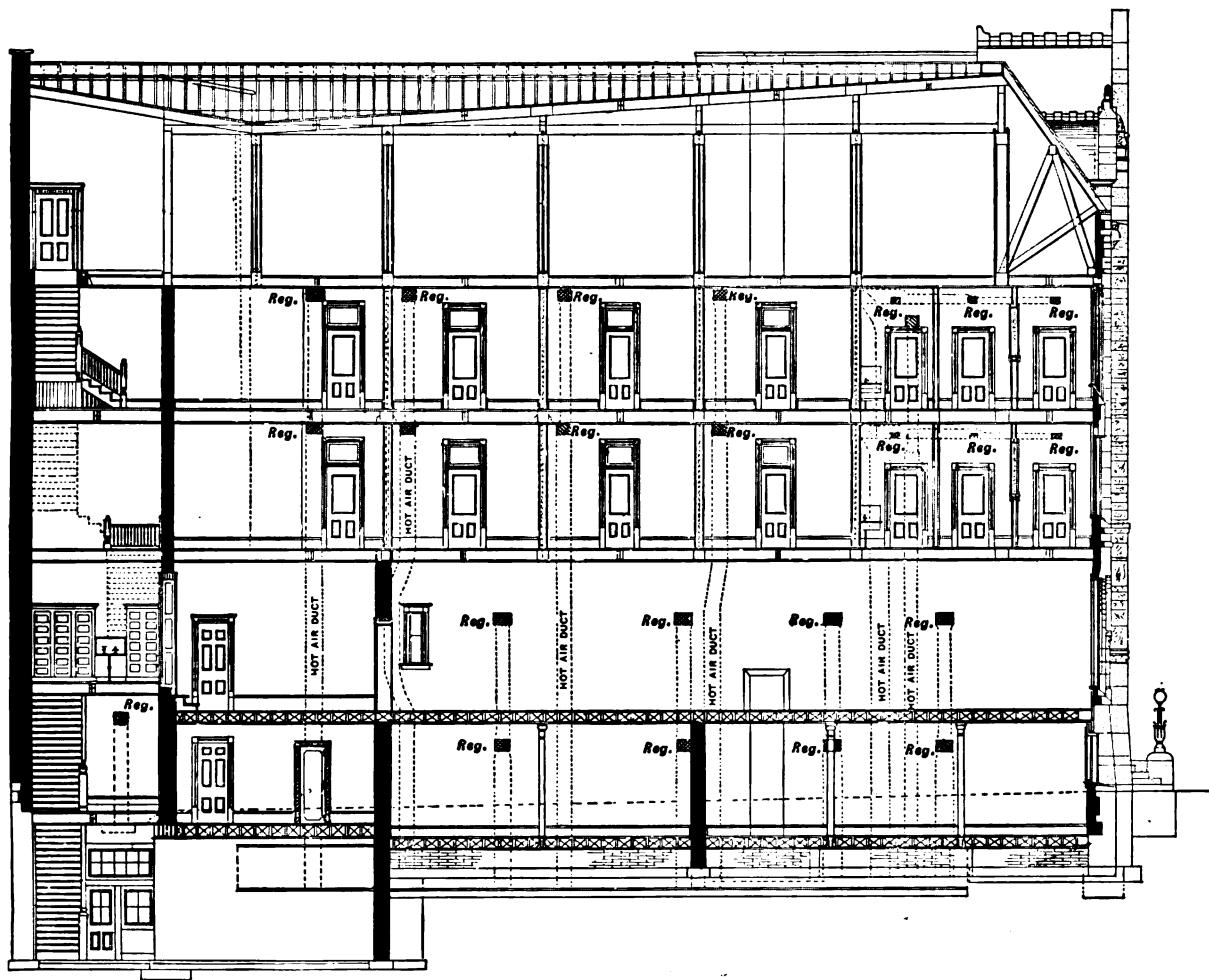


Central Savings Bank. Detail Fig. 5.

of 30 h. p., installed in the basement, and the manner of setting with steam connections leading to the apparatus is shown by the outline Fig. 2. In Fig. 3 we have a view of the boiler and steam connections, looking directly down upon the top of same, in which the workings of the Pratt & Cady Automatic Trap are clearly shown in conjunction with the receiver. To secure an economical heating arrangement, the water of condensation from the apparatus is, by means of the above devices, returned to boilers.

In Figs. 4 and 5, it will be seen that the fan illustrated receives intake of fresh air through a stack or flue, built into the walls of the building. The apparatus being located in the basement, the air is drawn down from top of building, through the fresh air stack especially provided, and is consequently free from dust and other impurities. The blow-through type of apparatus is employed and a valve or damper placed,

Buffalo Hot Blast System of Heating and Ventilating.



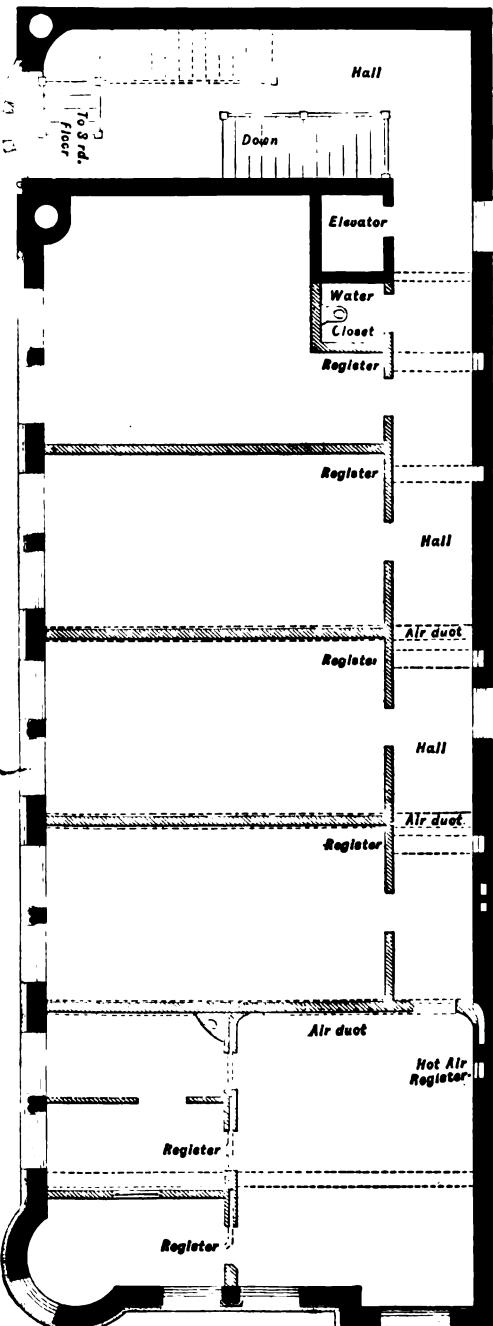
Central Savings Bank. Detail Fig. 6.

as indicated, between the fan and heater. This makes it possible to force cold and warm air at the same time, or each separate, as desired. In the first example, the air, after passing through the heater, becomes thoroughly incorporated in the main ducts, and may be regulated to any desired temperature. This device is especially valuable when only a moderate heat is required, but ample ventilation. In Fig. 5 we have a plan view of the fan and heater with its steam connections, looking down from the top or into the basement from the first floor directly over the apparatus.

From the transverse section of the building, so well illustrated in Fig. 6, the method of carrying the hot air to the different floors is clearly defined. A detailed description of the system adopted for introducing heat into each room is not here required, being shown to better advantage by the cut.

In passing, it may be mentioned that the hot air feeding ducts to the different portions to be heated are proportionately varied in area, according to the cubical space which each is destined to serve in heating and ventilating it.

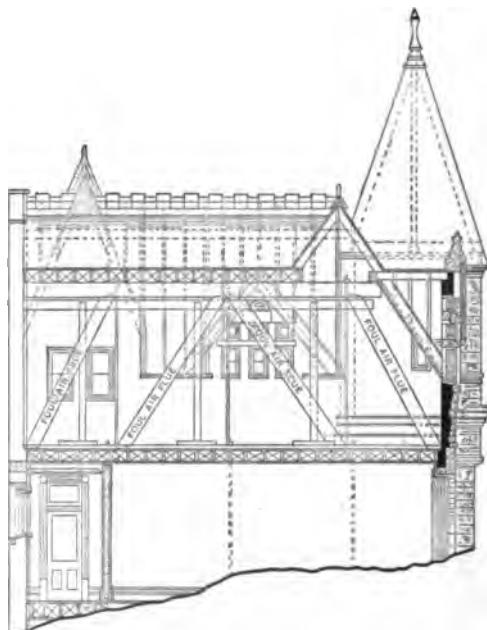
Buffalo Hot Blast System of Heating and Ventilating.



Central Savings Bank. Detail Fig. 7.

Fig. 7 shows the manner employed of carrying the hot air flues to the side of the building opposite the main ducts and the risers therefrom. Where interior arrangements of any of the apartments rendered it undesirable to locate the registers at regular intervals, it has been made feasible to overcome such objectionable points by means of this plan.

Ventilation is admirably accomplished through a system of foul air flues, correct in area and location, terminating in the attic. Fig. 8 represents a cross section of same, and shows the connections to the foul air ducts coming up from the floors below. To secure perfect ventilation, an equally intelligent arrangement of the vent flues is required, as when locating the hot air feeding ducts. The relative positions of the ventilating and heating registers should be carefully considered in every instance. Where this is done, ample ventilation will be secured in the natural course of the receding air, and buildings of ordinary size will not usually require a special fan connected to the foul air flues to induce the exit and removal of vitiated atmosphere.



Central Savings Bank. Detail Fig. 8.
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Buffalo Hot Blast System of Heating and Ventilating.



The Kentucky National Bank, Louisville, Ky. Digitized by Google

Buffalo Hot Blast System of Heating and Ventilating.

KENTUCKY NATIONAL BANK.—While touching upon the subject of banks as being structural examples for which the Buffalo Hot Blast System possesses pre-eminent advantages, we illustrate, on the foregoing page, the Kentucky National, of Louisville, Ky., which was designed by Architects McDonald Bros., of that city. The building is one of the finest and most substantial structures in the State, and the characteristics which make it especially convenient for the purpose of a banking institution are a credit to the architects.

The heating and ventilating system in the Kentucky National Bank was not designed by this house. The apparatus was installed by and under the direct supervision of Messrs. McGinness, Smith & Co., heating and ventilating engineers, of Pittsburgh, Pa. It consists of a Buffalo 110-inch Fan and Horizontal Engine connected directly to its shaft, with a Steam Hot Blast Heater containing a capacity of 3200 square feet heating surface, the entire outfit being located in the basement.

In all buildings of this type, foul air or ventilating flues are equally as important, and should be as intelligently arranged as the hot air supplies, thus ensuring an even temperature in every apartment, and results unapproached by any other method of heating and ventilation. It is also highly advisable that all flues should be built into the walls while the structure is in course of erection, as it is difficult to introduce ventilating or hot air ducts afterward without consuming valuable space. The usual thickness of walls is sufficient to derive the proper area for both sets of flues and thus the cost of application is reduced to a minimum.

In summer, the ventilation and cooling of a building of this character may be much better accomplished by running the fan, steam being turned off from the heater, than through any method of ceiling fans, which are nothing more or less than air agitators, and do not supply fresh air. There is no room for comparison between the two types, either in results secured or in running expenses.

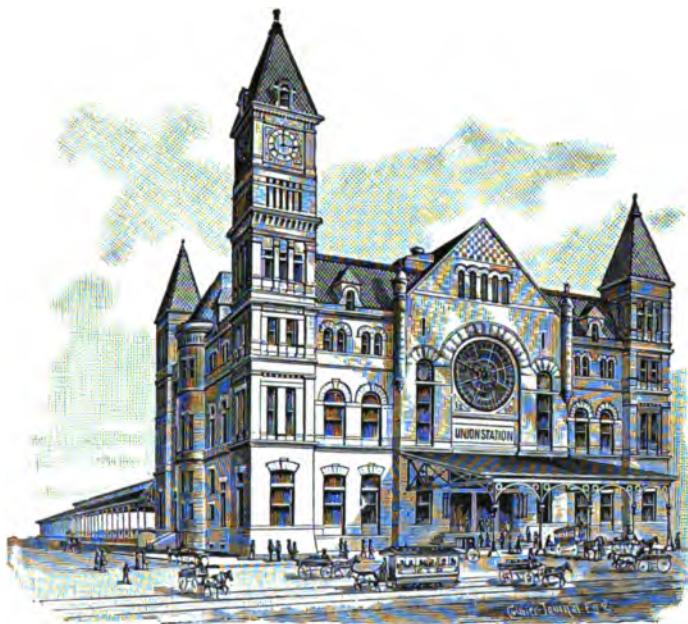
OTHER APPLICATIONS TO KINDRED BUILDINGS.—The location of coil heaters used in connection with fans for heating like buildings should be as central in relation to the space to be heated as practicable both for efficiency and economy. The same consideration given to the location of a Hot Blast Heater also applies in determining the position for the fan. It often occurs, especially in crowded cities where introducing the Buffalo Hot Blast System, that the space allotted for the apparatus is peculiar, and usually limited. Frequently, the fan and heater cannot be located in the usual contiguity. If, in such case, the heater can be placed in close relation to the space to be heated, and the fan and other moving parts of the apparatus be located in a small building outside, the arrangement will be found extremely desirable, and at the same time of comparatively low cost.

Where the heater is located with the fan in a separate building, and the conditions render it necessary to carry the air underground for some distance to the building to be heated, the cost of protecting the hot air ducts would be quite an item. In the former instance, however, protection of the ducts between the fan room and the main building is not required, inasmuch as there is no loss of radiation, the air becoming heated after passing over the coils which are located in the main structure itself. It will also be found economy to convey steam to a heating apparatus placed at some distance from the boilers, rather than to set it near a boiler and attempt to carry the hot air through the intervening space. In well covered pipes, live steam may be conveyed a considerable distance without materially reducing its efficiency for heating.

Unless placed in a separate building, rendered dust and smoke-proof by paper between the partitions, or some other device, a fan system outfit ought never be set in a boiler room for buildings of the type now being considered. The reasons are obvious: without these precautions being taken, smoke and dust would readily be drawn in by the fan and distributed through the buildings being ventilated and heated.

Whenever the fresh air supply to a fan must be taken from outside or smoky points, the evil effects of distributing such air through the building may be overcome by arranging the intake of fresh air to pass through a spray or jet of water either in the supplying duct or at a point near the inlet of the fan.

Buffalo Hot Blast System of Heating and Ventilating.



The L. & N. Union Station, Louisville, Ky.

THE present movement among railroads entering large cities, viz., of centering at one general depot, is highly commendable, affording the greatest convenience to the traveling public in change of routes, etc. By thus uniting the amounts which would otherwise be expended in a number of small depots, the result is magnificent structures, fitted with every possible convenience which would be desirable for a building of this kind and use.

The cut appearing above of the Union Station at Louisville, built by the Louisville & Nashville R. R., fails to impart anything like a correct comprehension of the grandeur and elegance of the structure. Something of an idea may be derived as to the extent of the depot when the capacity of the apparatus used for heating and ventilation of same is observed. The machinery for this purpose consists of three Buffalo Steel Plate Fans, 130 inches in diameter, having a combined capacity of displacing 19,656,000 cu. ft. of air per hour; in a building like this, a change of air effected once in ten to twelve minutes is sufficient for all requirements. Each fan is fitted with a Direct Acting Horizontal Engine of ample power, and Hot Blast Heating surface equaling 8000 square feet capacity is combined with the fans. The requisite elements for successful heating and ventilation, viz., fixed control of the air temperature, its quality and quantity, could not be embodied to better advantage.

The Buffalo Hot Blast System of Heating and Ventilating, aside from being installed into their more pretentious depots, has also found great favor with railroad corporations for heating and ventilating their machine, repair shops, etc. For all such service, the system possesses advantages unknown to any other. Heating and ventilating are united, and any exhaust steam which would otherwise be running to waste can be brought into service to much greater advantage than with any other type of heating apparatus. The entire heating surface is massed together in fire-proof case, and if there is not sufficient exhaust steam at command to accomplish the heating, additional live may be provided in the same heater, the consumption being materially less than required for direct radiation. In many instances, the fans are driven by belt from the main line, in which case, and where the exhaust steam is ample, the cost of heating is practically nothing after the apparatus is installed.

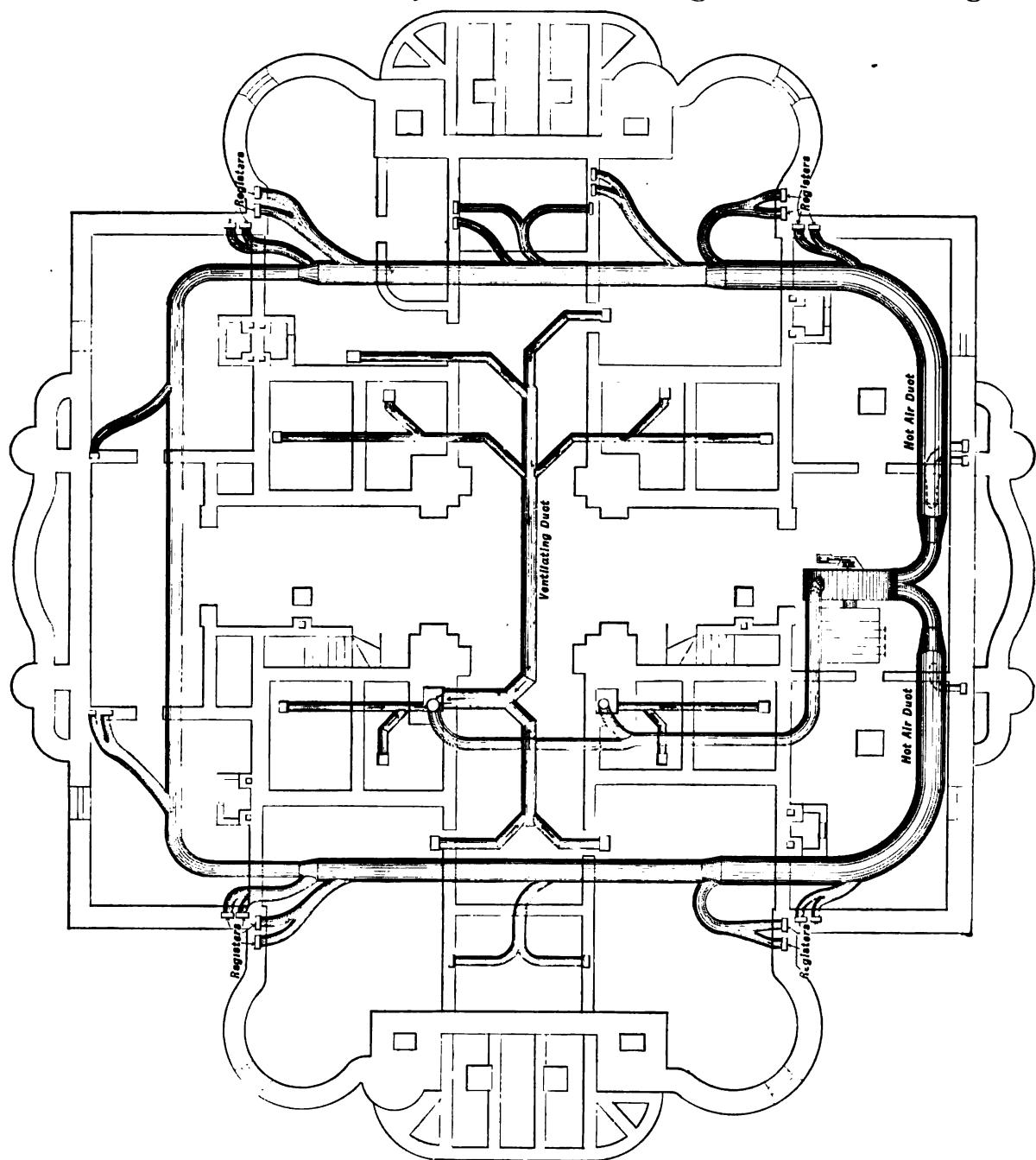
Buffalo Hot Blast System of Heating and Ventilating,

Application to Public Buildings.



The Williams County Court House, Bryan, Ohio. Fig. 1.

Buffalo Hot Blast System of Heating and Ventilating.



Williams County Court House. Detail Fig. Digitized by Google

Buffalo Hot Blast System of Heating and Ventilating.

WILLIAMS COUNTY COURT HOUSE.—In a building used for legislative purposes, an ample amount of pure and mildly tempered air is an indispensable feature of a successful heating and ventilating plant. Such an outfit is illustrated by the cuts referring to the Williams County Court House, Bryan, O., in which is installed the Buffalo Hot Blast System of Heating and Ventilation. In Fig. 1 we have a half-tone illustration of the building, designed by Architects E. O. Fallis & Son, Toledo, Ohio. In Fig. 2 we have a correct illustration of the runs of hot air ducts designed for this building, and feeding the various heating registers; it is also an excellent example of a model layout of a piping system.

On foregoing pages, illustrations and descriptions have appeared, showing the more common forms of boiler setting and of making steam connections to Hot Blast Apparatus; therefore, a reference to these points is not embodied herewith. The entire machinery was put in by Messrs. Shaw, Kendall & Co., Toledo.

A close examination of Fig. 2 will reveal the fact that the fan, which is 120 inches in diameter, draws the air through the heater, and, after becoming thoroughly heated, delivers it through the hot air ducts and registers to the various apartments. The fan, which is of the three-quarter housing type, well illustrated by the engraving on page 14, is driven by a Direct Connected Horizontal Engine. The heating surface consists of 3500 square feet capacity. Ventilation of the building is admirably accomplished through a system of flues designed and located with especial reference to the purpose. As will be observed by close scrutiny of Fig. 2 the fan is provided with two outlets, one of comparatively small area.

HEATING AIR PIPES AND BRANCHES.—Inasmuch as the illustrations of the piping layout for the Williams County Court House, and of other subjects which follow, present a very good idea of the conditions to be met in heating and ventilating such buildings, the following remarks, covering the different points of proportioning and constructing same for efficiency, will be appropriate.

After having determined the location and size of fan and heater for a given building, it is then necessary to consider the sizes, position and construction of the main distributing pipes and branches leading from the heating apparatus. In the most efficient "Fan" Heating Systems the main air pipe, directly on leaving the mouth of the fan, or the outlet of the heater if the fan is to blow instead of exhaust through the heater, is expanded from 25 per cent. to 50 per cent. over the area of the fan or heater outlet, whichever construction is used. Fifty per cent. will always be ample in the most extreme cases, but nothing short of 25 per cent. increased area over the outlet of heating apparatus is allowable. The object of this is to reduce the velocity of the air and to insure a large volume with the least possible resistance. When branches are taken from large main air ducts there is much less liability of inequalities in the results obtained at the different branch outlets, than there would be in taking the branches from small air pipes through which the air is passing at a high velocity. In such pipes, the natural tendency of air currents is to pass by the outlets, and take a more direct or easier course. While it is not wholly impossible to successfully take out several branches from a duct through which air is passing at high velocity and obtain nearly the same results in each branch, the finest point in constructing such to reach the desired end would be necessary. As branch pipes are taken from the main duct, this should be decreased in size, not in proportion to the area of the branch pipes taken therefrom, but in proportion to their frictional surfaces. By consulting tables on succeeding pages, giving the necessary increase in diameter of pipes for handling the same amount of air at a given pressure through different lengths of pipe, it will be seen that, to properly lay out a system of air piping, it should be first sketched out on the plan and all sizes marked in, proportionate to their several duties and the relation between the different reductions of main pipes and branches made according to their frictional surfaces. The entire system may then be gone over and the proper corrections made for the different distances

Buffalo Hot Blast System of Heating and Ventilating.

traveled. For example, two flues, one 5 feet, and the other 50 feet from the fan, are required, each to do the same duty, and to accomplish this duty under the same circumstances it is required to have a 20-inch pipe. It will be seen by consulting the table that if a 20-inch pipe were the required size for the flue which is only 5 feet from the fan, it will require a 23-inch pipe to supply the flue 50 feet away, thus providing for the additional friction surface and placing it on an equal footing for doing the same service, under the condition of greater distance.

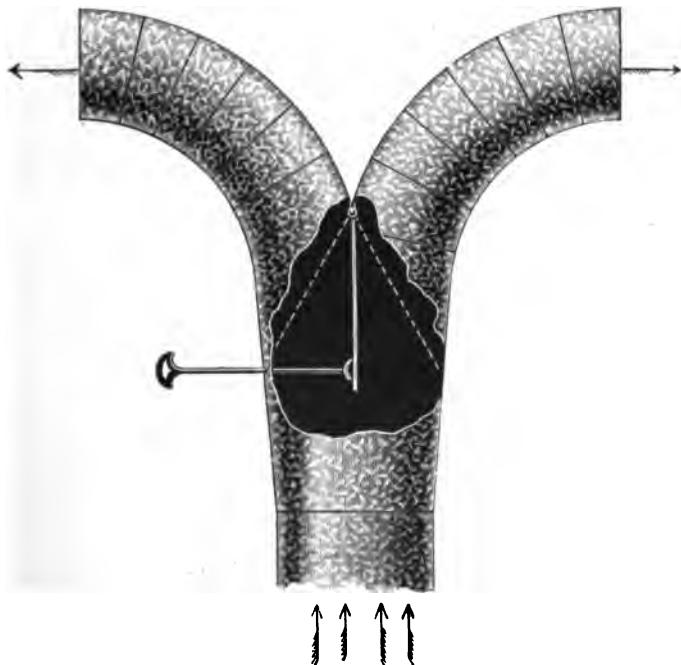
The best material for main distributing pipes as well as their branches is galvanized iron, of proper gauge of different diameters as per table, and their shape should be round whenever possible. Round pipe is easier constructed, and has the largest effective area with a given perimeter of any known figure.

Where rectangular pipes have to be used the area should be increased at least 20 per cent. (25 per cent. is better) over that necessary for round pipe. Pipes should be made in lengths convenient to handle, say about 10 feet each, having joints lapped nearly 2 inches in the direction of the air current. Joints should be riveted every 4 or 6 inches, and to insure their being tight they may be soldered all the way around. Section ends may be provided with cast iron rings about $\frac{1}{2}$ of an inch thick and from 1 to $1\frac{1}{2}$ inches wide, according to the diameter, so that the different ones can be easily put up or taken down. Elbows or curves should be made of from 6 to 10 pieces, and have equal lengths in the throat, and the radius of all curves should be equal to four diameters, measured from the center line of the elbow. Branch pipes when taken from the main should always leave with a 45-degree elbow, and never be connected straight into it. When the branch is taken from the brick duct or metal air pipe rectangular in shape, the reduction in size of the main flue should be made sidewise on the side from which branch is taken, keeping the opposite side of the flue

straight. It will be seen when this is done that the currents of air are kept parallel, or in a straight line until divided. In making the "Y" branches or "T's", it is well to change the direction of the air pipe or duct before it reaches the "T" so that the direction of the air current will be proportionately divided by a "V" shape of the "T" or "Y" for their respective duties.

It is always desirable, when it is difficult to determine just which side the "Y" or "T" should be favored most, to construct in it a damper or equalizer, as here illustrated, which may be adjusted after the apparatus has been started up. Such a damper is also useful for entirely closing off the current from any branch when heat is not desired in the rooms to which it leads.

For Hot Blast Heating work the usual velocity for air in main pipes is about 3000 feet per minute, in branch pipes about 1500 feet, in vertical flues 700 to 1000 feet; discharge through registers from 500 to 600 feet.



Equalizer for Regulating Air Currents. Fig. 3.

Buffalo Hot Blast System of Heating and Ventilating,

Application to Theatres, Etc.



The Chicago Auditorium, Chicago, Ill.

IT IS safe to say that no other building in America has become so widely known as the one represented by the above engraving. The imposing Chicago Auditorium is one of the finest creations of those well-known architects, Messrs. Adler & Sullivan, Chicago, Ill. Though the cut is well executed from one of the best photographs which has yet been taken, a correct comprehension of the grandeur and magnificence of the structure can hardly be secured therefrom.

The entire Auditorium is heated with the Hot Blast or Plenum System. To present a complete and detailed description of all the features, by the usual method of engravings, etc., would require a single volume nearly as large as this. There are used in this building no less than 15 fans of the different designs and types illustrated in this catalogue, ranging from 4 to 20 feet in diameter, every fan used in the building being furnished by this house. After mature deliberation and consultation with the engineers, the management decided to adopt Buffalo Fans *exclusively*, for the entire equipment, as being the best mechanisms for the purpose to be obtained.

In the "Architectural Record," New York, Vol. 1, No. 4, may be found an excellent description by Mr. Dankmar Adler, with handsome illustrations of the various details of the Chicago Auditorium, and we quote from the article as follows:

"The Auditorium Building illustrates how the versatile Western American can combine sentiment with thrift, and demonstrates how he can endeavor to cultivate the service of Mammon simultaneously with an effort to attain his higher artistic ideals. The wish of Chicago to possess an Opera House larger and finer

Buffalo Hot Blast System of Heating and Ventilating.

than the Metropolitan, a hall for great choral and orchestral concerts, a mammoth ball-room, a convention hall, an auditorium for mass meetings, etc., all under the same roof and within the same walls, gave birth to the Auditorium proper. The desire that the Auditorium be made self-sustaining, and not like the Metropolitan Opera House, a perpetual financial burden to its owners, rendered necessary the external subordination of the Auditorium itself to the business building and hotel, which, together with it, form the Auditorium Building. * * * Much attention has been paid to the heating, cooling and ventilating apparatus. The fresh air comes down through the shaft, in which it is subjected to the action of a heavy spray. This, at all seasons of the year, washes from the air much of the dust and soot with which it is charged. In winter, warm brine is used to prevent the shower from freezing. In summer, from 12 to 20 tons of ice are used for cooling the shower, and with it the air. Salt is mixed with the melting ice to still further lower the temperature. For warming the air in winter, it is carried through steam coils, so sub-divided and provided with valves that very minute gradations of temperature can be effected. A system of ducts carries the air into the different parts of the Auditorium, to the stage and to the various corridors, foyers and dressing rooms. The general movement of the air is from the stage outward, and from the ceiling downward. The air is removed from the theatre by the operation of three disc wheels, two 8 feet in diameter, and one 6 feet in diameter. Ducts are carried to these exhaust fans from openings in the risers of all the steppings for the seats throughout the house, and from registers in every foyer, corridor, cloak room, dressing room, toilet room, etc. Besides this main ventilating apparatus, there are 10 smaller fans used for the ventilation of the engine room, stores, kitchens, laundries, banquet hall, bath room, water closets, etc. Especially noteworthy is an exhaust fan, connected by means of suitable ducts with every one of the 400 rooms containing plumbing fixtures in the hotel."

In the space at command, it is utterly impossible to even refer to the various details of the arrangement of the different sections of the building. Inasmuch as the theatre portion excels in design, arrangement, proportions, acoustics, and all points which combine to place the Auditorium ahead of any similar audience room in the world, a further quotation from the same article, referring thereto, cannot be amiss:

"The Auditorium proper, with its accessories, occupies an area of 35,800 square feet, out of a total area of 63,500 feet for the site of the building. Its cubic contents are 2,800,000 cubic feet, out of a total of 8,300,000 feet for the entire building. Its general dimensions are 118 x 246 feet. To this must be added the spaces occupied for entrances and exits, parlors and smoking rooms, organ chamber and stage dressing rooms, which encroach upon and penetrate the surrounding business and hotel buildings, some in one story only, others through from two to six stories. Again, stair and elevator shafts of the business buildings and hotel make encroachments upon the Auditorium. These overlappings and interpenetrations form a Chinese puzzle, which cannot be understood unless illustrated by a complete set of plans and sections. On the main floor, the stage occupies a depth of 70 feet, the orchestra 12 feet, the parquette 104 feet and the main foyer 60 feet. The main floor contains about 1,400 seats, arranged in generous sweeping curves, and stepped up upon lines of Scott Russell's isacoustic curve, with a total rise of 17 feet. Advantage is taken of this rise to obtain, under the higher parts of the parquette, an entrance foyer 80 x 118 feet, and a series of wardrobe and cloak rooms of quite generous capacity. These are at the end of the Auditorium, partly under the main foyer and partly under the parquette, opening from the entrance foyer and extending along both sides of the parquette. On the outside of the same are corridors 14 feet wide.

"This unusually great rise of the main floor has also made practicable the arrangement of six entrances, similar to the "Vomitoria" of the Roman amphitheatre, by which the lower half of the parquette seats are reached without rendering it necessary to climb to the upper level of the main floor. Excessive crowding upon the main stairs is also avoided. The boxes, forty in number, are arranged in two tiers upon each side of the parquette. The lower tier forms an arcade of semi-circular arches with rather light treatment and but little effect of enclosure, while the upper boxes are entirely open. In fact, there is nothing at all of the box-like and stuffy effect produced by the conventional treatment of the open box."

"The main balcony, elliptical in plan, is 80 feet deep at the end, but quite narrow at the sides. It covers the main foyer and overhangs the parquette 20 feet at the end, but is not quite wide enough at the sides to completely cover the boxes. The seats are also arranged on the lines of the Scott Russell isacoustic curve, which here develops into a rise of about 40 feet from the lowest to the highest seat."

Buffalo Hot Blast System of Heating and Ventilating,

Application to Hospitals.



The Buffalo State Hospital, Buffalo, N. Y. Fig. 1.

THE half-tone reproduction herewith of the Buffalo State Hospital, designed by Architect W. W. Carlin of this city, shows only a portion of the buildings, having been executed some time ago, and before the completion of recent additions. Continued increased demands made upon the institution have led to the erection of a series of buildings extending to the left of the main structure, in keeping with the general design.

The hospital being only intended for the reception of insane inmates, the majority of whom are otherwise in a good state of health, it was not deemed expedient, on account of the expense, to introduce the double system of ducts after the manner employed for the St. Mary's Hospital. Excepting in violent cases, the patients are not confined to their individual apartments, being allowed access to the spacious corridors, greenhouses and reception rooms, so that the above feature would be of comparatively little value.

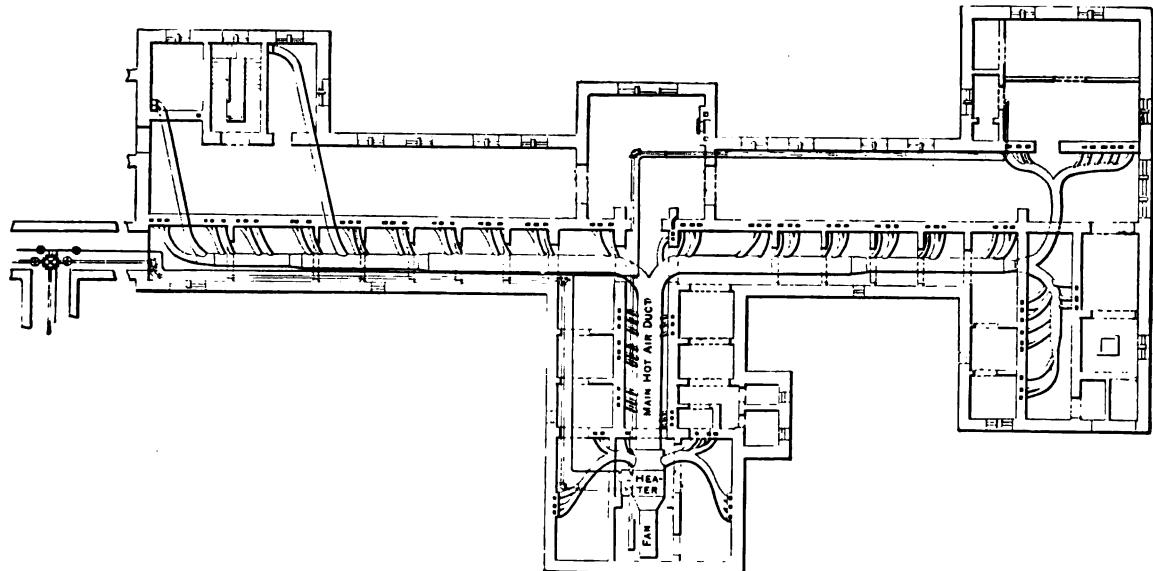
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Buffalo Hot Blast System of Heating and Ventilating.

Hospitals, like every other type of buildings, vary in their requirements for heating and ventilation, and are subject to several classifications. Nearly every city of upwards of 10,000 inhabitants has its building for the reception of contagious diseases, and it is commonly called the "pest house." Generally speaking, these are cheap temporary structures, planned in utter ignorance or disregard of the laws of ventilation, and erected to meet emergencies. It is certainly befitting that such hospitals, even though great demand upon the institution is infrequent, be carefully constructed, and, while necessarily simple and cheap, positive and perfect means of ventilation should be embodied in their equipment; the Fan System would naturally be the one selected in this event. Provision should be made for a very great increase upon the usual allowance of air per person. Those interested in the planning and arrangement of hospitals will be favored with drawings suited to any especial conditions upon application.

As will be observed by a close examination of detailed Fig. 2, for the Buffalo State Hospital the blow-through type of apparatus was employed. The cubical contents of this building being great, and exposed on every side to all the elements, necessitated the installation of a plant of comparatively large capacity. It is here impossible to describe all the details of the outfit, it being a large one, and necessarily numerous. The hot air flues were built into the building, and the connection of the flues to the main hot air ducts leading from the apparatus is clearly shown by Fig. 2. By laying out the plant with flues of large area, and making the hot air connections direct, as shown, the result is a minimum amount of friction combined with quiet operation of the plant.

As this hospital is one of the most important of its character, and the foremost institution of this kind in the State of New York, it is but appropriate that the best heating and ventilating apparatus extant should be selected. A fair idea of the extent of the building may be derived from the fact that in the male ward "A," alone, the heating and ventilating machinery consists of a Buffalo 150-inch Fan with Horizontal Engine and 4600 square feet capacity Buffalo Hot Blast Heating surface, the outfit having a further complement of the usual accessories. At an average speed, this fan has a capacity of delivering 95,000 cubic feet of air per minute, tempered to a mild and healthful degree.



Buffalo State Hospital. Detail Fig. 2.

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Buffalo Hot Blast System of Heating and Ventilating,

Application to Hospitals.



St. Mary's Hospital (Catholic), Saginaw, Mich. Fig. 1.

THE engraving appearing above of the St. Mary's Catholic Hospital, Saginaw, Michigan, designed by Architects Keith & Moore, falls short of conveying a true idea of the extent or importance of the institution. The bad results of imperfect ventilation, or having an impure supply of air, are more strikingly evident in hospitals than in other buildings, owing to their continuous occupation, also to the lowered vitality of inmates, and this being duly appreciated by both the architects and founders of this institution, it was decided to adopt the most approved system of heating and ventilation. To this end the engineers of this house were consulted, with the result of plans and specifications for a Buffalo Hot Blast System being prepared and submitted.

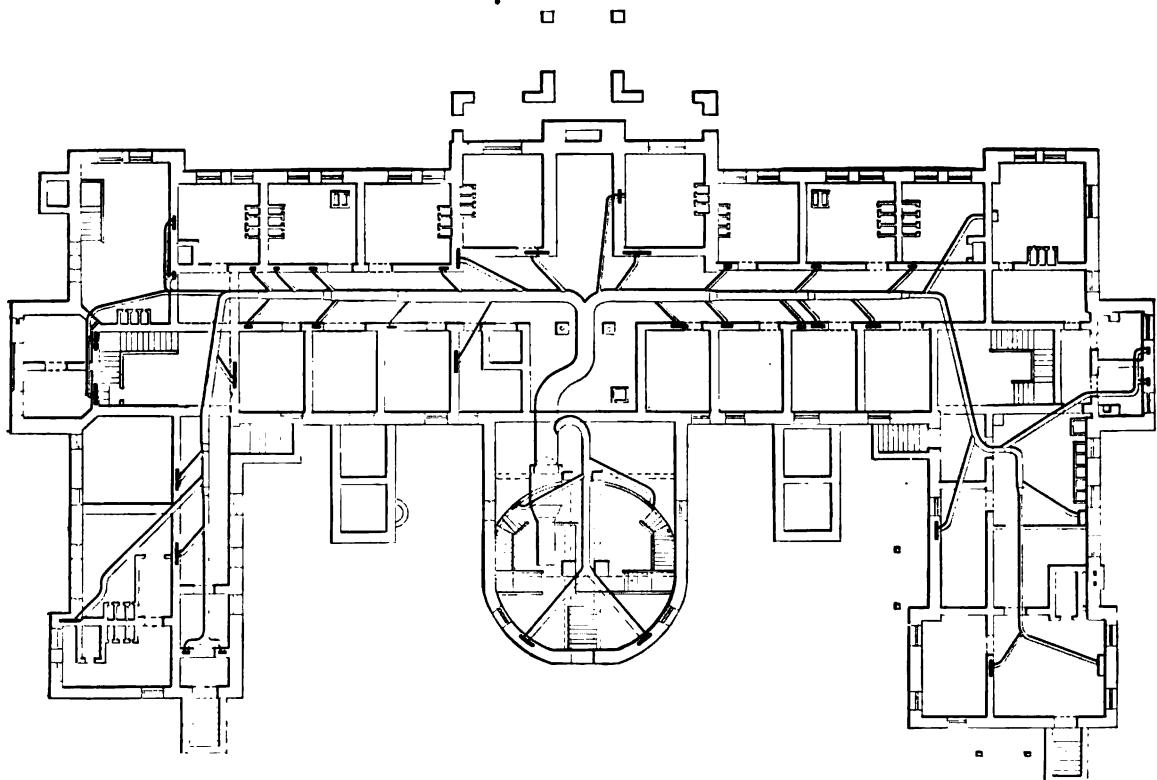
Recognizing fully the great advantages derived from having perfect regulation of the temperature in individual rooms, the heating and ventilating engineers decided to introduce a double system of ducts. As will be observed by the several outline cuts, a warm and cold air duct connects direct to each register box. A mixing damper is provided, whereby it is made possible that the entire supply of air shall be either all cold or all warm, or mixed in any desired proportion. Patients suffering from maladies of a widely different nature are often confined in apartments in close juxtaposition. A heating and ventilating system which must furnish those afflicted with feverous diseases with the same temperature of air that must be maintained in the rooms of patients whose requirements are directly the opposite, would not be a success, in the truest sense of the word, even though the air supplied be pure.

Buffalo Hot Blast System of Heating and Ventilating.

To those unfamiliar with the subject, it may appear almost an impossibility to place under perfect control the amount of warm and cold air introduced by one apparatus into rooms so closely together. This, however, is a very simple method of application, but exceeds the cost of a single air supply system to the extent of an additional duct and a somewhat greater fan capacity. The method of operating the dampers and their relation to the flues is clearly portrayed by Fig. 6. By intelligent operation, the temperature in every room throughout the entire hospital may be kept under perfect and positive control, and any desired degree of heat may be maintained with the greatest uniformity and ease.

In Fig. 2 the general run of the hot air conveying piping will be observed. The fan is of the three-quarter housing type, and forces the air over the hot blast coils, from whence it is conveyed through the piping and wall flues to the rooms to be heated. As is illustrated by the apparatus outline of the Central Savings Bank, on page 74, a cold air by-pass, supplied with air direct from the fan before passing through the heater, leads to the duplicate or cold air duct. A damper is provided at this by-pass to permit regulation of the amount of air supplied to both the cold and warm air flues, though the dampers at the flues leading to the individual rooms are mostly depended upon for governing the temperature.

Figs. 3, 4 and 5 give a very clear idea of how the double ducts connect to base of vertical flues, with the dampers, etc. The lower portion of Fig. 6 shows the damper regulation required to vary the amount of either hot or cold air supplied. At the top of the cut is shown a vent flue; the foul air registers are located near the floor line throughout the building, and in correct position with reference to the hot air supply.



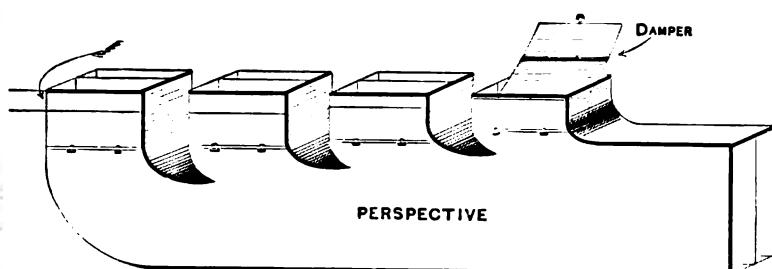
St. Mary's Hospital. Detail Fig. 2.

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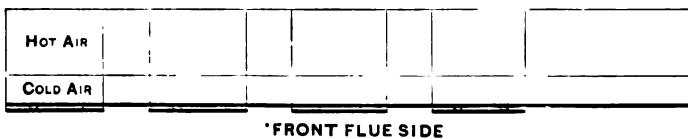
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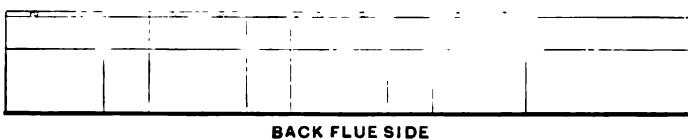
Fig. 6.



St. Mary's Hospital. Detail Fig. 3.



St. Mary's Hospital. Detail Fig. 4.



St. Mary's Hospital. Detail Fig. 5.

The location of the moving parts of a heating and ventilating apparatus for a building of this nature should be, if possible, isolated. On account of the attendant expense of properly protecting the hot air ducts, it is not usually advisable to locate a Hot Blast Heating plant at any great distance from the space to be heated. If the apparatus building cannot be located near it, it will be found cheaper and more effective to provide a place for the heater near to the work to be performed, and convey steam to it, rather than to convey the hot air from the apparatus room through the intervening space. In the former instance, protection of the flue leading from fan to the heater, which is usually underground, will not be necessary, while in the latter it will be imperative.

Continuous operation of this plant has shown most excellent results, and we quote as follows from an official communication from the authorities of the institution, which incidentally refers to the heating and ventilating apparatus: "We would say that the heating apparatus is most satisfactory, and we think it is the best method for ventilation ever invented."

Buffalo Hot Blast System of Heating and Ventilating.



The Y. M. C. A., Cincinnati, Ohio.

A MODEL Y. M. C. A.—Little more than an outline of the handsome Young Men's Christian Association, of Cincinnati, O., designed by Architect Jas. McLaughlin, of that city, is shown in the above engraving.

Fresh air, heated to a comfortable degree, is forced to all rooms through hot air flues by means of a 100-inch Buffalo Steel Plate Fan having an engine directly connected to its shaft. The air is first heated by passing through a steam heater of the same make and containing 3200 sq. ft. capacity of hot blast heating surface. During the summer, steam is turned off from the heater, and a continual circulation of cool fresh air is ensured by running the fan at a moderate speed.

In the present building, the results to be obtained necessitated the introduction of a Buffalo 90-inch Steel Plate Exhaust Steam Fan to operate independent of the fan driving the fresh heated air to the various rooms. Great benefit is derived from the use of the eduction fan, in rapidly removing the foul air from the large assembly or auditorium room whenever an audience is assembled therein. By the use of dampers, the quantity of air removed from this room may be regulated to a nicety.

The arrangement of the foul air ducts and connection with the exhauster further provide for exhausting the steam arising from the large swimming tanks and bath rooms in basement. The intended exhilarating effects of this department, therefore, are fully realized, the air not being so heavily laden with moisture and vivified by respiration as to make it foul and unhealthy in the extreme, which is the usual characteristic of such situations. The closets also have connection to the ducts which communicate directly with the Exhaust Fan. Ventilation and absolute freedom of disagreeable odors from such places can only be accomplished by mechanical means and with a fan separate from the one supplying the heated air.

Buffalo Hot Blast System of Heating and Ventilating,
Application to Churches.



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The Wesley M. E. Church, Minneapolis, Minn. Fig. 1.

Buffalo Hot Blast System of Heating and Ventilating,

Application to Church Buildings.

ONE of the most magnificent edifices of the North West is the Wesley Methodist Episcopal Church, of Minneapolis, designed by Archt. Warren D. Hayes of that city. The handsome half-tone engraving appearing herewith is an excellent likeness of the structure, which is built of brown stone. The Hot Blast Apparatus was installed by Messrs. C. S. Wenthworth & Co., heating and ventilating engineers and contractors of the same city. The outfit includes a 140-inch Buffalo Steel Plate Fan, capable of moving 80,000 cu. ft. of air per minute at ordinary working speed, being driven by an Independent Self-contained Horizontal Engine.

In the application of the hot air and ventilating ducts to a building of this nature and use, the characteristic features differ quite materially from those of other types. It will be observed, by comparison of the outline cuts of adaptation appearing herewith, that as the number of stories increase, and as the extension of buildings is varied, the Buffalo Steam Hot Blast Apparatus finds new means of application.

Fig. 2 not only shows the regulation of the hot air conveying ducts and ventilating flues in the Wesley M. E. Church, but illustrates a common form of application to buildings of this character. As the moving parts of the apparatus were to be located in the basement, and directly underneath the pulpit, it was feared that this application of the outfit would produce objectionable noise. This was most happily overcome by building the ducts of large area, and choosing a fan of sufficient capacity to accomplish the heating and ventilation of the building at a slow speed. Notwithstanding the fact it was necessary to locate the apparatus in the very point that would naturally be avoided, the running of the plant is so quiet as to be unnoticeable during any time of the service.

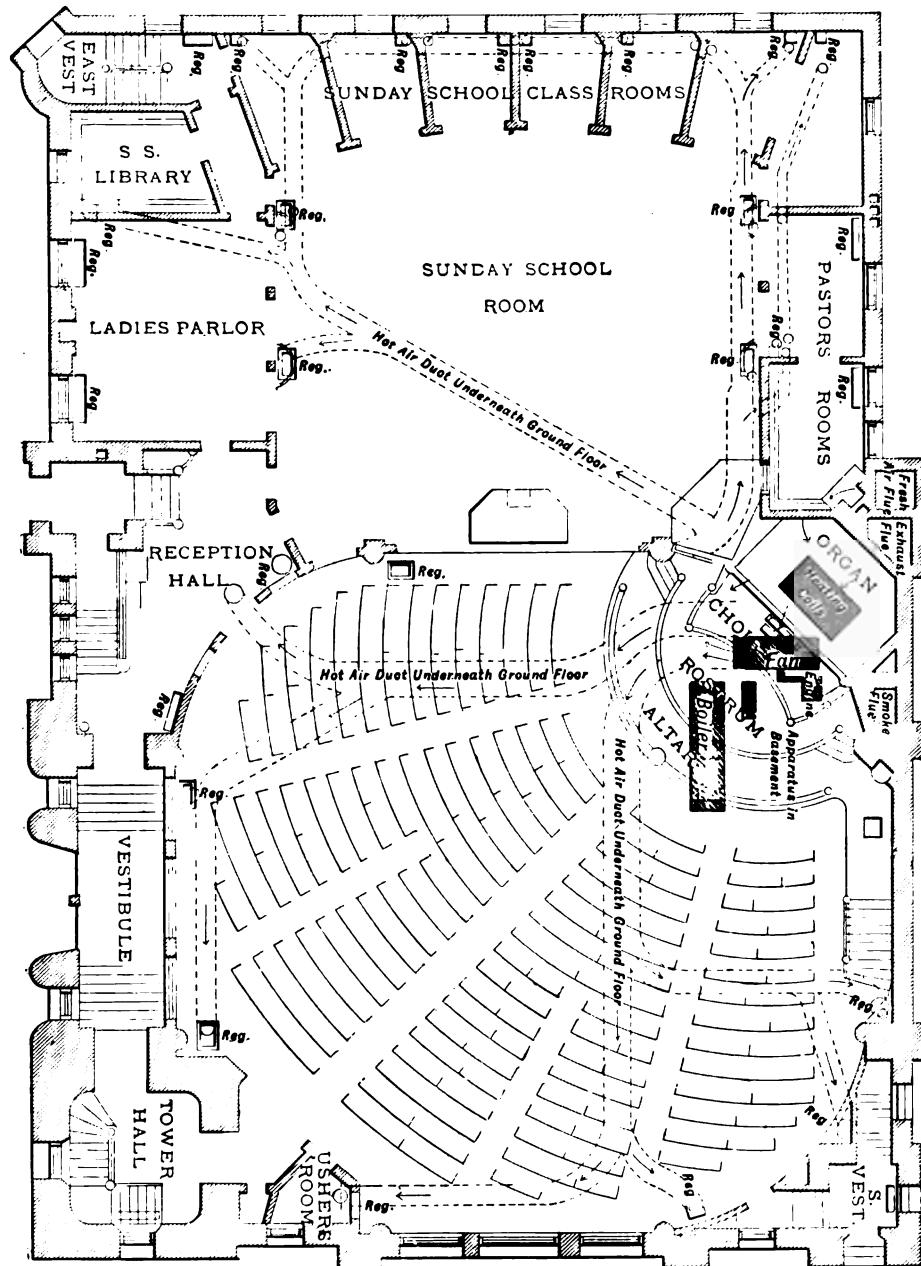
The maximum speed of fan with steam on the heater will comfortably warm the entire church if run only for a short time before service; thus in severe weather it is unnecessary to fire up the boilers a day or so in advance, which is quite customary and imperative with other methods of heating.

The want of proper ventilation in our churches is clearly apparent, and it is to be regretted that the subject is not, generally speaking, handled with better results. Perhaps it is due to the fact that the heating and ventilation, usually, is left until so late a day that the funds at command have reached so low an ebb that only the least expensive apparatus can be purchased; for this reason, no doubt, the mere apologies of heating and ventilating plants existing to-day in many churches are due. Officiating clergymen and singers find the vitiated air, prevalent in buildings not outfitted with mechanical means of ventilation, exceedingly trying to the health and voice. Opening the windows serves fairly well for about three months in the course of the year; during the remainder, this method of ventilation is strongly objected to, on account of drafts. By combining the heating and ventilating plant into one apparatus, as afforded by the Buffalo Hot Blast System, the atmosphere will always be rendered pure and comfortable, as steam may be turned off from the heater and the fan operated by itself whenever desired.

We take pleasure in calling attention to the following extract from letters referring to the heating and ventilating apparatus from the chairman of the Building Committee, and also from the architect, as follows: "With reference to the Buffalo Hot Blast Heating and Ventilating plant installed in the Wesley Methodist Episcopal Church by Messrs. C. S. Wenthworth & Co., of this city, we desire to say that the results secured are very gratifying. All interested in the building are enthusiastic over the operation of the plant, and are satisfied that a more efficient and economical heating and ventilating outfit it would be hard to find. Our church is a large and handsome structure; therefore, in deciding on a heating and ventilating plant, we wished to secure the best which could be purchased, and in reaching a decision for the apparatus which has been installed, we are confident we have not gone amiss. At any time you may desire, you can refer parties who wish a modern and efficient apparatus for church heating and ventilation to the Wesley Methodist Episcopal Church of Minneapolis."--H. H. Lillibridge, Chairman Building Committee. *** "I mail you to-day an 8 x 10 photo view of the Methodist Episcopal Church, in which your 11-ft. Blower is doing such fine work. I am greatly pleased with the efficiency and quietness of the plant." --Warren D. Hayes, Architect.

Buffalo Hot Blast System of Heating and Ventilating,

Application to Churches.



Wesley M. E. Church. Detail Fig. 2.

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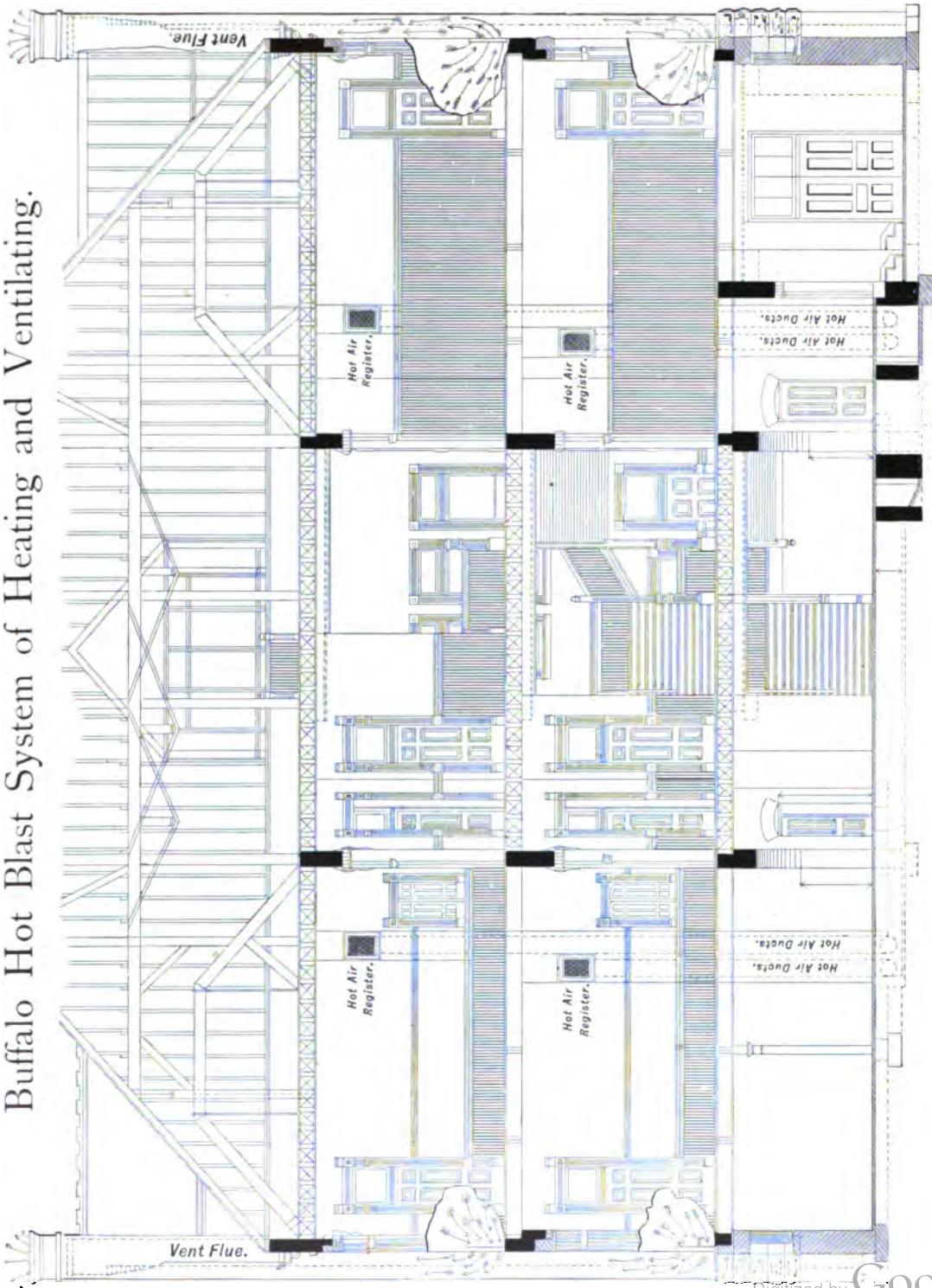
Buffalo Hot Blast System of Heating and Ventilating,

Application to Public Schools.



East Fifth Street Public School, Canton, Ohio. Fig. I.

Buffalo Hot Blast System of Heating and Ventilating.



Public School, Canton, Ohio. Detail Fig. 2.

Buffalo Hot Blast System of Heating and Ventilating,

Application to School Buildings.

THE remarks of J. S. Billings, M. D., LL. D., in his "Principles of Heating and Ventilation and Their Application," appearing in the chapter devoted to school buildings, so forcibly apply to the exact conditions, that we cannot refrain from quoting from them herewith: "Of all classes of buildings in the United States, public or private, there are probably none which are in such an unsatisfactory condition, as regards their ventilation, as the public schools. In our large cities, they are, almost without exception, overcrowded and insufficiently supplied with air, and for these, and other reasons which I need not here specify, they are probably the cause of a vast amount of ill health and premature death, although these results are usually not so direct and immediate that they can be clearly traced. Every intelligent teacher knows that the dullness and listlessness in some pupils, and the irritability and peevishness in others, which are so manifest toward the close of the afternoon session, are closely connected with the gradual accumulation of foul air which has been going on through the day. If, after a brisk walk in the open air, you enter one of our city school rooms about 3 p. m., you will find an odor which is far from being agreeable, and which, under such circumstances, is the characteristic sign of insufficient ventilation. I have before me the results of the examination of the schools in Boston, New York, Baltimore, Washington, Cincinnati and Rochester, made by competent men, and accompanied in many cases by chemical analyses showing the amount of impurity present in the air. Everywhere the result is the same; with a change of name of place one report would almost answer for all."

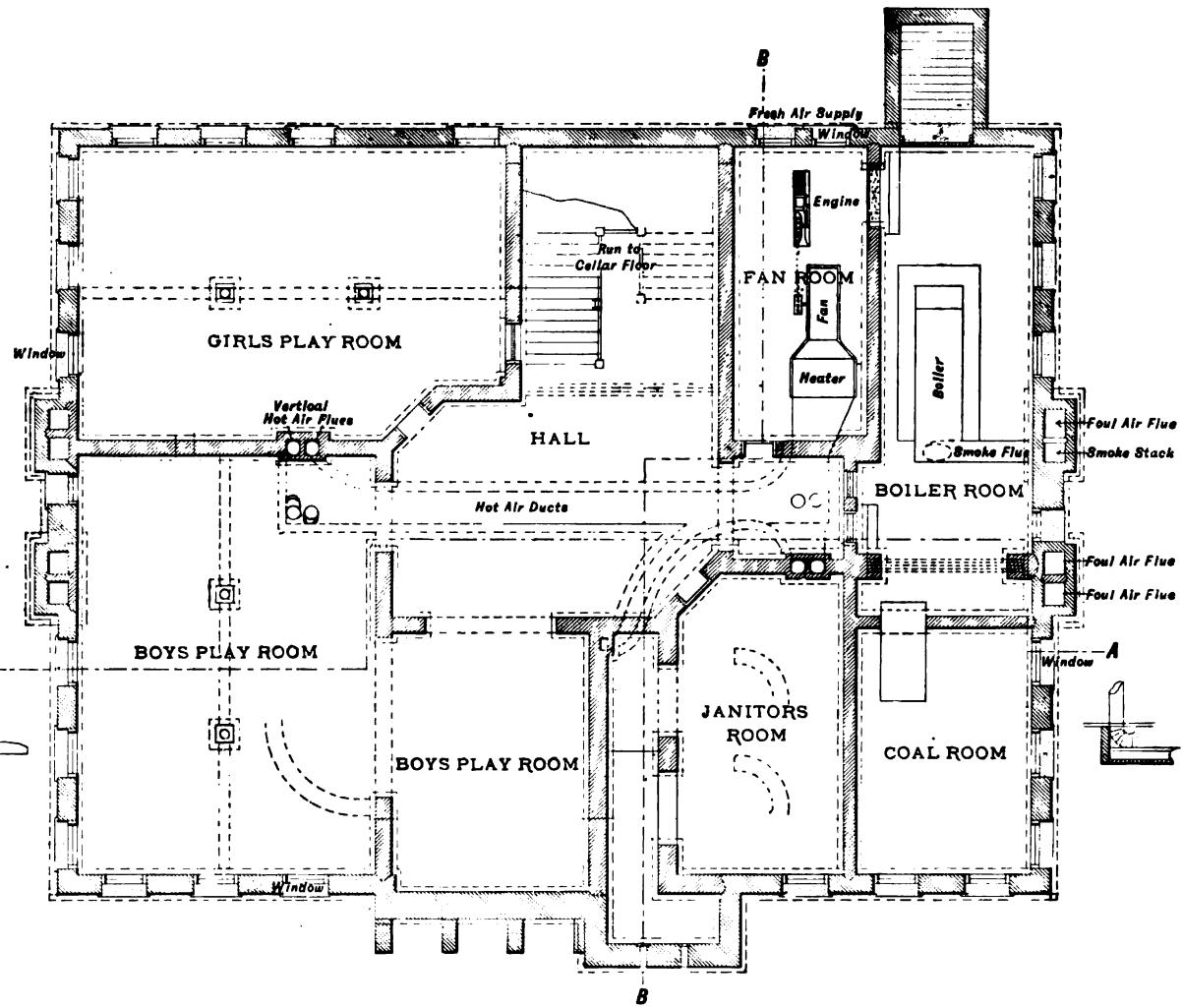
A careful and honest investigation of all so-called heating and ventilating outfits which have up to this date been installed into existing school buildings, can have no other result than that the above remarks will apply to every plant not equipped with mechanical ventilation and steam heating. This does not exclude those furnace and dry-closet systems which have attracted considerable attention in certain sections, for, viewing such plants in their true light, their working is unreliable, thorough ventilation not being accomplished, and the comparative cost of maintenance is extremely high, with liability to fire risk, great. It will be further found that the combination of steam heat and positive ventilation as embodied in the Buffalo Hot Blast Apparatus is unapproached, for no conscientious engineer will attempt to argue that any system of natural ventilation is thoroughly reliable under all atmospheric conditions.

Fig. 1 is a half-tone reproduction of a public school building in Canton, O., of which Mr. Guy Tilden, of the same city, is the architect. Several schools have been built from the same plans, and all equipped with Buffalo Steam Hot Blast Apparatus, giving the best of satisfaction in every detail. Outline cut, Fig. 2, is simply presented to show the manner of introducing the heated air to the different rooms, and the escape of the foul and vitiated air through the vent shafts. It will be observed, by a careful study of the engraving, that the air does not enter at one end of the room, passing out at the other, which might be the impression at a first glance. Fig. 3 shows the method of conveying hot air from the heater and connections to flues.

As the Buffalo Steam Hot Blast System of Heating and Ventilation finds varied means of adaptation according to the construction of buildings, we show the application to a widely different form of school house architecture in Fig. 4, and one which is rapidly coming into popular favor in the Western cities. Like the Canton schools, several buildings have been constructed from the same drawings, and all equipped with the Buffalo Hot Blast System of Heating and Ventilation. The mere fact that these apparatus have been introduced into hundreds of schools in various sections of the country, where honest comparisons may be made, and with results acknowledged to be far exceeding those of any other system, in points of comfort to the occupants and reduction of running cost, is ample evidence in their favor.

Buffalo Hot Blast System of Heating and Ventilating,

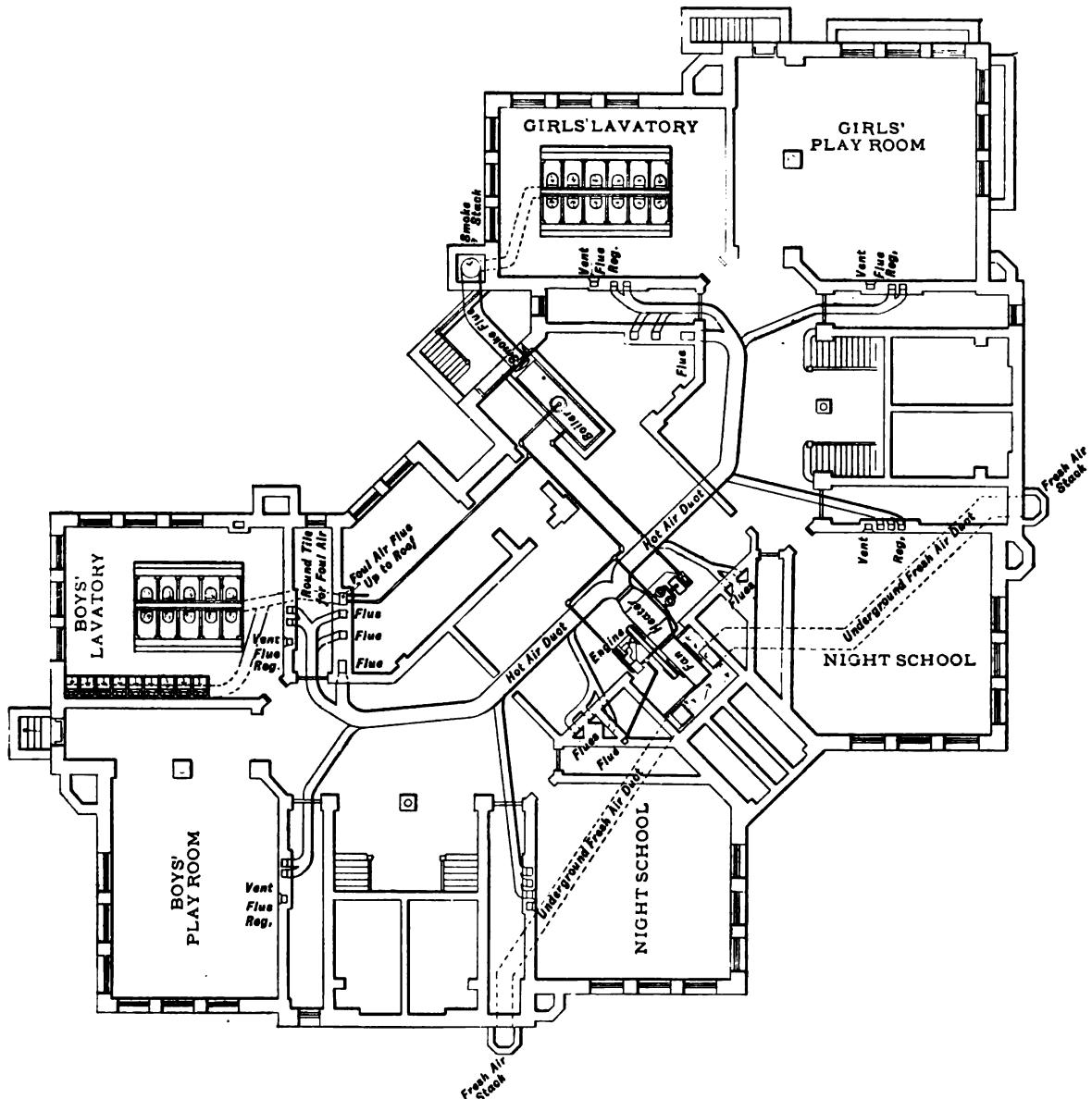
Application to School Buildings.



East Fifth Street Public School, Canton, Ohio. Detail Fig. 3.

Buffalo Hot Blast System of Heating and Ventilating.

Application to School Buildings.

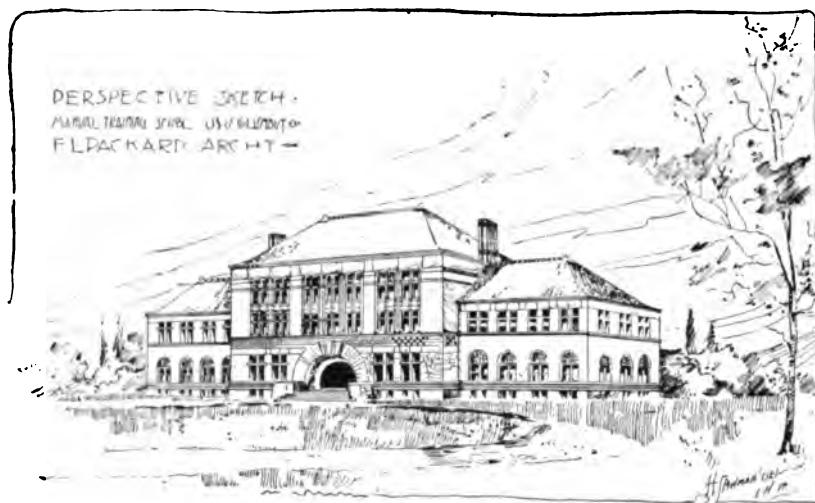


Public School Building, Salt Lake City, Utah. Detail Fig. 4.

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Buffalo Hot Blast System of Heating and Ventilating,

Application to Training Schools.



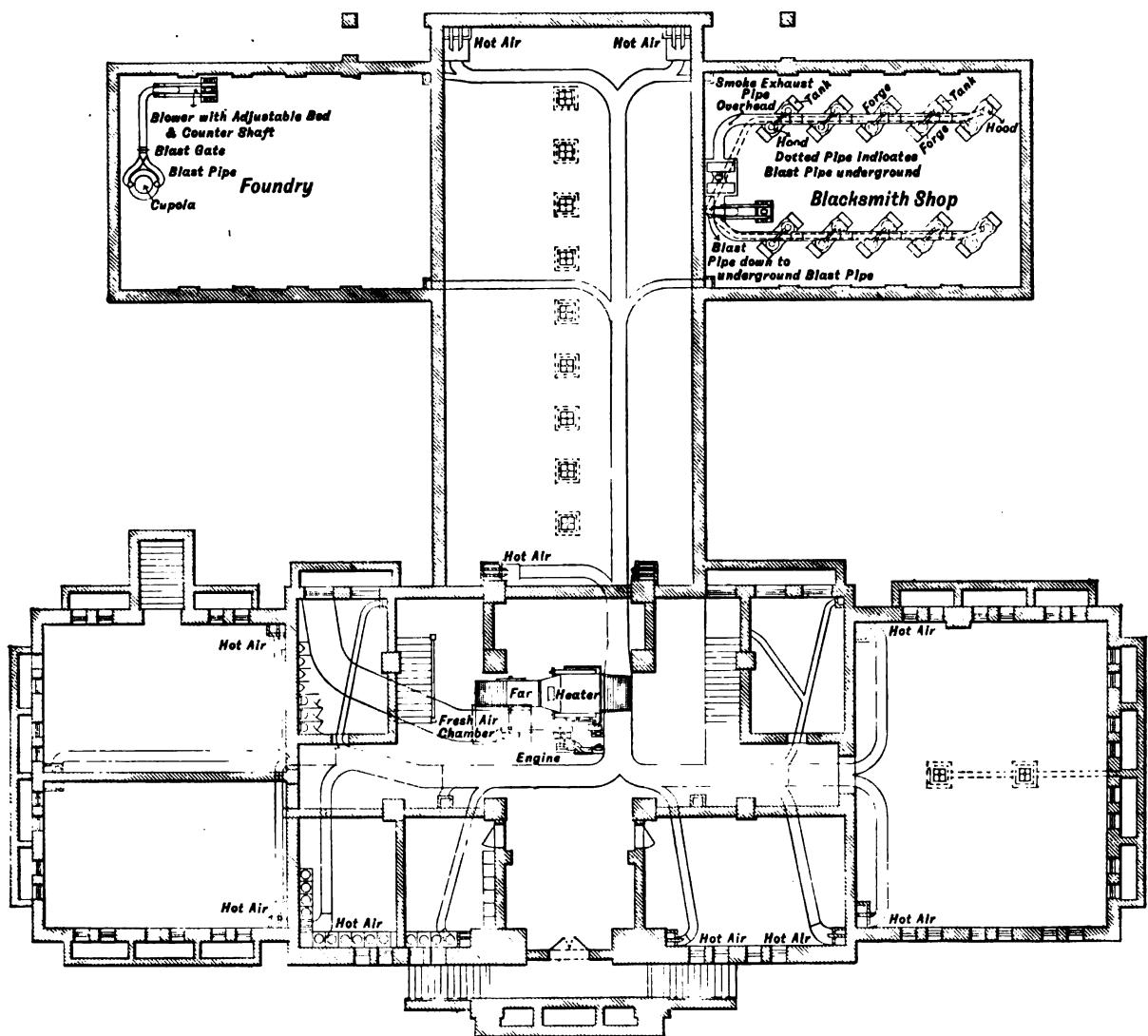
The State Manual Training School, Columbus, Ohio. Fig. 1.

EVERY leading training school, either State or private, throughout not only America, but foreign countries as well, has been equipped with the celebrated Buffalo Forges, Blowers for furnishing the blast, and Exhausters for removing the smoke, Buffalo Punch, Shear and Bar Cutters, and, in fact, with all our improved tools which naturally come into use in such institutions.

It is hardly necessary to say that the primary object of technical schools is to acquaint students with the most approved shop methods of producing work, and also of equipping complete plants with machinery, for many graduates find ready employment in this line upon leaving school. As such schools advocate and teach the best mechanisms by procuring such in every line, naturally this house has found considerable demand for its Hot Blast Heating and Ventilating Apparatus for application to these institutions. The great advance of the blower system for mill and factory heating is not more clearly apparent than in the fact that few training schools of any size which are now being erected, are equipped with any other form of heating and ventilating apparatus.

The Manual Training School of the Ohio State University, designed by Mr. F. L. Packard, associated with Messrs. Yost & Packard, architects, of Columbus, Ohio, is represented by the above cut. The illustration afforded by Fig. 2 portrays by a longitudinal section the method of distributing the hot air to the various portions of the building. Fig. 3 shows the general run of the air piping leading to the blacksmith shop, foundry and other apartments. It will be observed that the usual equipment of Buffalo Forges, Blowers for supplying blast to same, and Exhausters for handling the smoke and heat is present. A separate Buffalo Blower is provided for the cupola in the foundry. In the space at command, the details of the outfit can not be treated at length, but a complete set of blue prints of this and similar schools outfitted with Buffalo Hot Blast plants will be cheerfully furnished to heads of similar institutions desiring them either for exhibition drawings, or for designing a plant suited to their needs. By reference to the engraving, it will at once be evident to mechanics who have enjoyed a college training, and those who have visited various schools, that this building is one of the most elegant and complete in any State used for the same purpose. The cubic contents is 498,950, and a Buffalo Hot Blast Apparatus was selected for the heating outfit consisting of a 130-inch Steel Plate Fan, with a heater of 6,500 square feet of heating surface. It being desirable to effect a change of air once in ten minutes, necessitated the above size of fan, which easily accomplishes the purpose running at an average speed.

Buffalo Hot Blast System of Heating and Ventilating, Application to Training Schools.

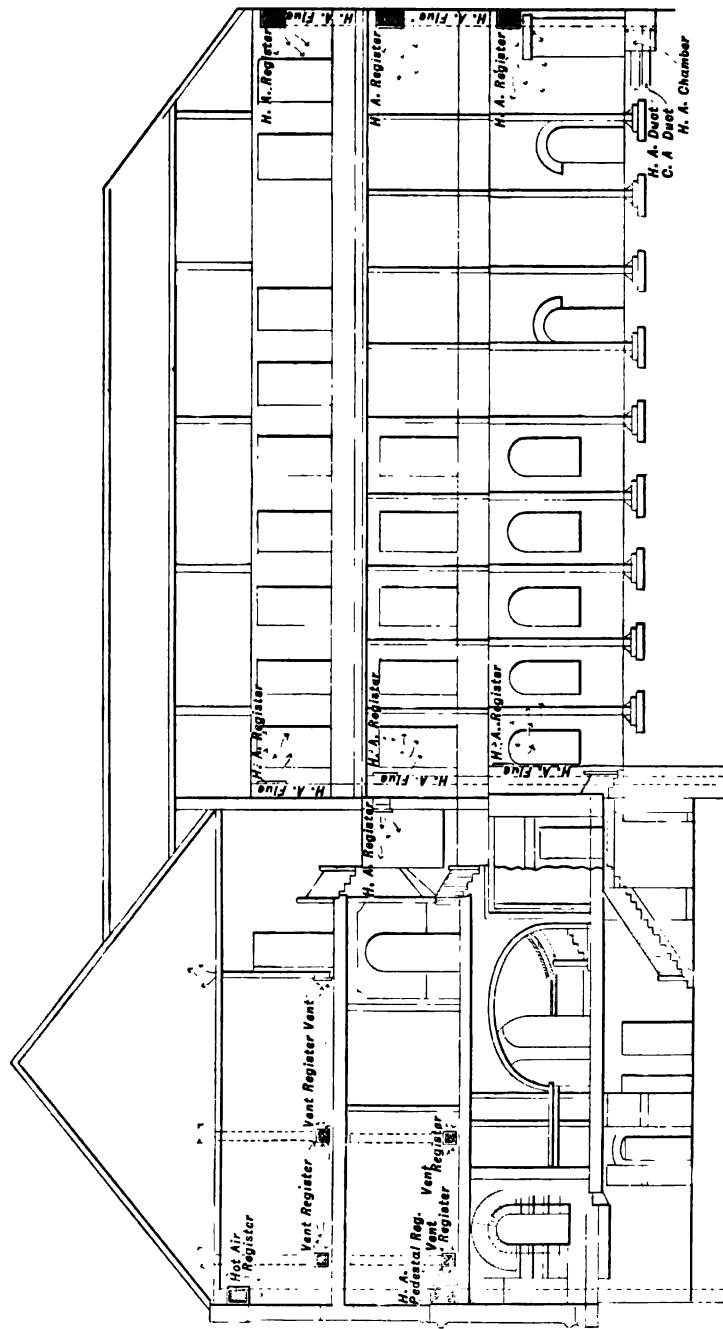


Ohio State Manual Training School. Detail Fig. 3.

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Buffalo Hot Blast System of Heating and Ventilating,

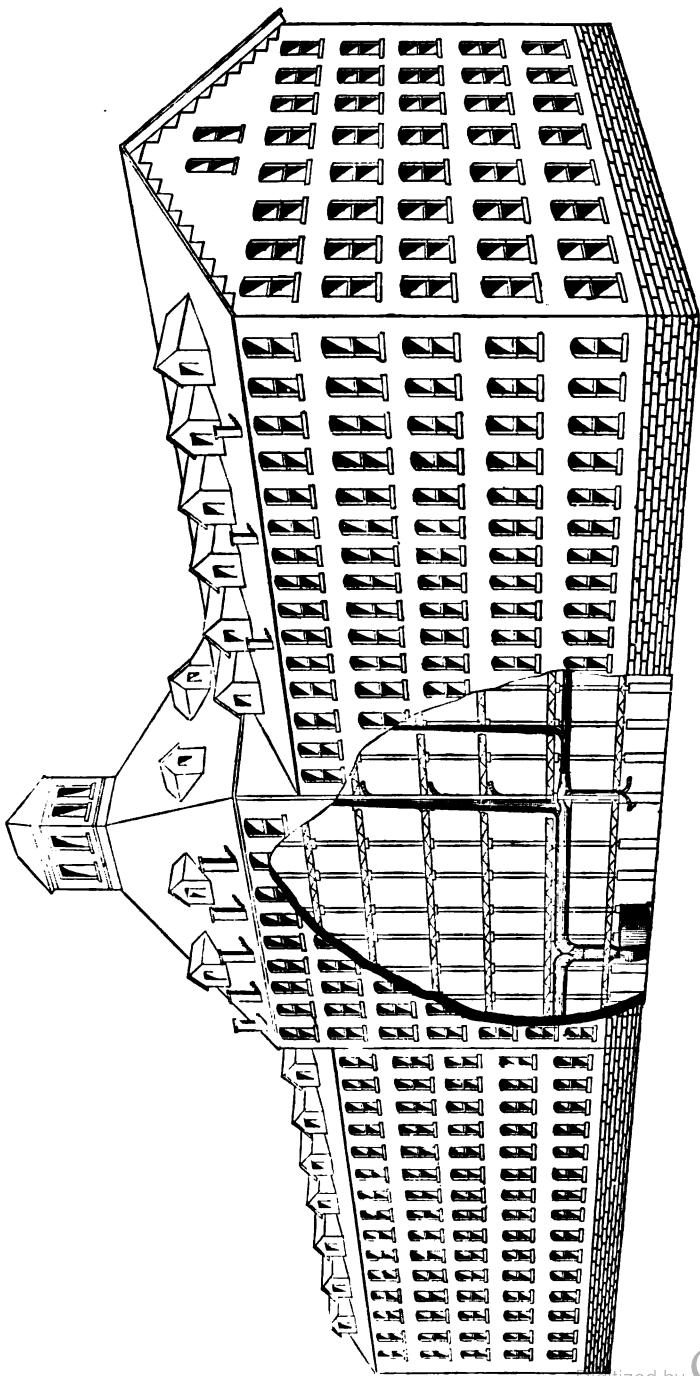
Application to Training Schools.



Ohio State Manual Training School. Detail Fig. 2.

Buffalo Hot Blast System of Heating and Ventilating,

Application to a Wagon Factory.



The Binghamton Wagon Works, Binghamton, N. Y. Detail Fig. 1.

Buffalo Hot Blast System of Heating and Ventilating,

Application to Factory Buildings.

BUILDINGS used for manufacturing purposes vary so greatly in their forms of construction, that it is here impossible to describe at length applications which will be suited to all conditions. The illustrations presented are simply characteristic types of the more common outfits. A modification of the application of the apparatus will readily adapt it for heating and ventilating every form and type of factory or mill construction. Upon request, drawings will be supplied to intending purchasers of heating and ventilating apparatus in any line of industry, giving a comprehensive idea of the application in all its details as made to a similar building, together with a list of like manufactoryes outfitted with Buffalo Hot Blast plants which may be inspected, if desired.

The prime features which have accelerated the rapid introduction of the Buffalo Steam Hot Blast System into thousands of the largest manufactoryes throughout the continent may be briefly enumerated as follows: Comparative low initial cost of installation, minimum expense for running, entire freedom of expenses for subsequent repairs, great uniformity of temperature throughout the space heated, benefits derived from the ventilation, both in summer and winter, attendant upon the use of the fans, and freedom from fire risk. The merits of the Buffalo Hot Blast System by no means end with the above. These will apply to every manufacturing industry where heat is required in winter. The assertion is correct that scarcely a single line of manufacture exists for which this heating system does not possess peculiar advantages not to be found in any other. These will be clearly apparent upon investigation, and do not require to be pointed out to the careful observer.

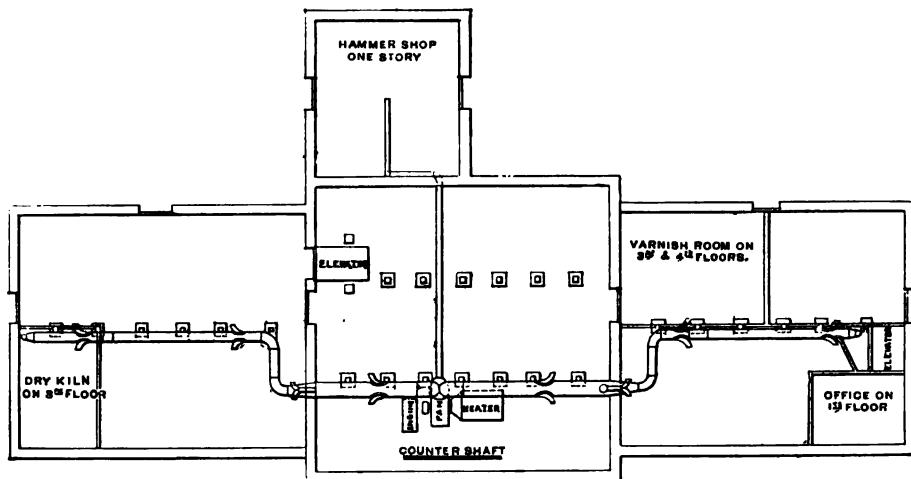
The amount of air delivered into a factory for heating being usually in excess of that actually required for ventilation, the occupants generally being separated, great economy in cost of running will be secured by using over again a portion of the air previously heated. This is generally accomplished, in a building of the form shown on the preceding page, by drawing the air to the fan down through stairways or openings provided especially for the purpose. In one-story buildings, this may be done by arranging dampers or doors so that a part of the air entering the fan may be taken from the outside, and the balance from the room in which the apparatus is operating. Provision may be made for taking all of the air out of doors, which is desirable in summer, or in extreme cold weather taking the entire supply from the room to be heated.

In silk and textile mills or other like industries, where a large number of occupants are employed, it is then usually found necessary, in order to have perfect ventilation, to take the entire source of air supply directly from out of doors.

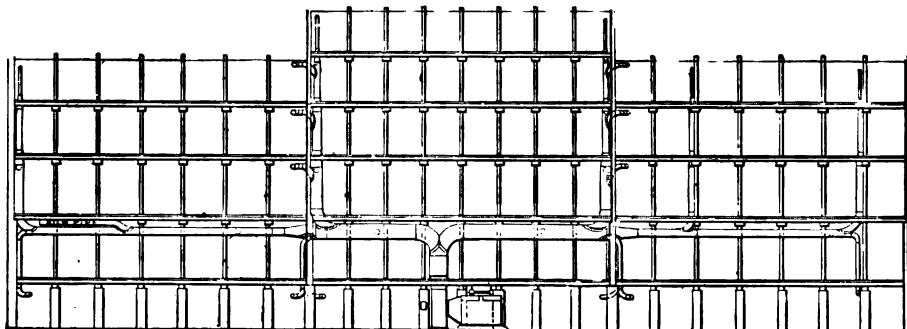
Although the plant is one of the earlier ones supplied by this house, and the machinery not of our latest construction, we illustrate in Fig. 1, a five-story building with basement of the Binghamton Wagon Co., Binghamton, N. Y., heated and ventilated with the Buffalo Hot Blast or Blower System. It will be observed that, by selecting an up blast discharge exhaust fan for this location, and first drawing the air over the coils, the fan handling it hot, a most compact apparatus is secured. The position assigned for the outfit being in the basement, and the space to be heated being largely above it, the greatest efficiency of a given size of apparatus is obtained by choosing a fan to discharge directly upward into the main flue, and hence the layout of all the conveying pipes assumes the most simple form.

By referring to Fig. 2, it will be observed that one single branch pipe leads to the office, partitioned off on the first floor. At the left of the main duct, branch pipes lead to the dry kilns which are located on the third floor. These pipes are naturally of much larger diameter than would be used if employed for heating, at an average temperature, rooms of this size. They are so proportioned as to maintain a temperature of from 130 to 140 degrees in the dry rooms, and to change the air once in two or three minutes, or oftener, dependent upon the speed of the fan. By the use of dampers provided for the purpose all the heat from the apparatus may be turned into the kilns when desired. In summer, the dampers in pipe leading to different

Buffalo Hot Blast System of Heating and Ventilating.



Binghamton Wagon Works. Detail Fig. 2.



Binghamton Wagon Works. Detail Fig. 3.

portions of the buildings are kept entirely closed, and with a minimum speed of fan, an equal temperature and change of air is secured in the kilns to that obtained in cold weather when running at a maximum speed, and when the apparatus is heating the factory and kiln at the same time.

Fig. 3 gives the details of the hot air piping not embodied in the other cuts. It will be observed by further reference to Fig. 2, that the one-story hammer shop is heated by a single pipe leading from the main flue directly through the main building to this department of the works. It being desirable to heat the basement also, branch pipes are brought down from the two mains, directing the air currents to such portions of this department as are not sufficiently warmed by direct radiation from the apparatus itself.

Buffalo Hot Blast System of Heating and Ventilating,

General Applications to Factory Buildings.

ON THE five pages which follow, we illustrate a variety of buildings outfitted with the Buffalo Hot Blast System of Heating and Ventilating, applied to as many different conditions to be met with in factories of varied form and use.

In Fig. 1 appears an ordinary method of adapting the system to the gallery type of manufactories, which form is now being widely adopted for large shops, the building being of iron construction. It will be observed, by a close examination, the storage room, blacksmith shop, engine and boiler rooms, comprise a small structure, but located conveniently adjacent to the main building, which is a large machine shop. The position chosen for the location of the apparatus is in the engine room, as a matter of convenience in operating, and that the most simple form of piping application could be readily made. The outfit, being a very large one, necessitated the use of a Three-quarter Housing Steam Fan, which, with a bottom horizontal discharge, found convenient connection with the underground hot air duct leading into the main building from which risers or stand pipes are taken. The greatest economy of overhead space in the apparatus room is thus secured. The heater is built in the duplex or two-division form, either section of which may be operated independently, if desired. A door in the heater housing directly opposite the fan is also provided, so that when the outfit is running solely for cooling, the air may receive a direct entrance to the fan. An entirely comprehensive idea as to the system will be secured by following out the details clearly portrayed in Figs. 1 and 2; the latter gives a detailed plan of the piping layout. In a building of this nature, ready enough exit for the air will be found through opening doors, windows and various crevices, so that foul air ducts are not necessitated, as in the example of public buildings.

In a large number of buildings of the gallery type, the position of the hot blast apparatus will be most convenient upon a platform supported by roof trusses. The overhead system of hot air piping will then be employed, and, unless the shop be of great width, discharge pipes will be carried close to the walls and branch pipes lead from same at convenient distances, bringing the currents of heated air down near the floor. By this method, a uniform temperature is secured throughout the building, and instead of all the heated air rising immediately to the top, as is the case when the building is heated by direct steam, with the result of the floor and lower portions of the rooms where operatives are at work being cold, the effect is directly the opposite, and a comfortable temperature is maintained where it is needed.

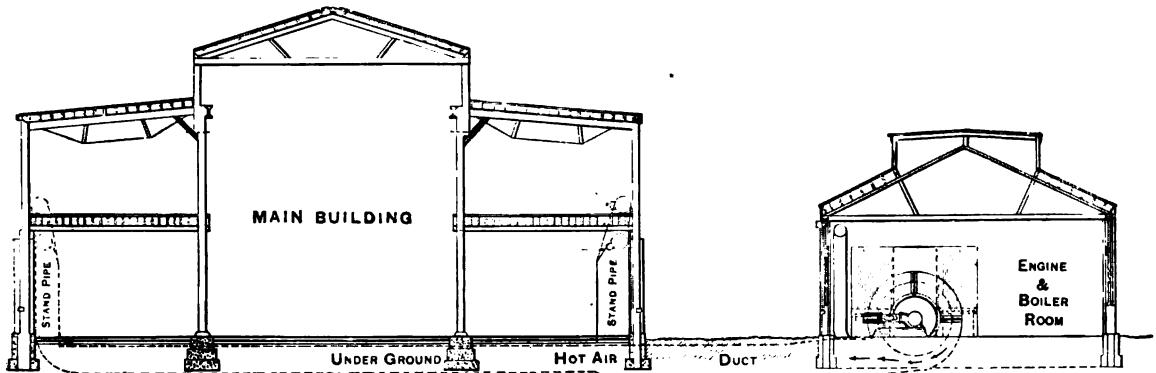
In Fig. 3 we illustrate the triangular building of Messrs. Hall & McChesney, the printing and book-binding firm of Syracuse, N. Y. This subject affords a good illustration of how smaller buildings may be economically outfitted with hot blast plants. To allow the fan to receive its intake of air from dirty or smoky points would be a disagreeable feature, especially in buildings of this nature where neat work is being produced, as it would be forced and distributed by the fan through conveying pipes over all work in course of completion. To overcome such objections, a fresh air flue is built nearly in the center of the building leading up to the outside. Through this, which connects to the fan inlet by means of an underground duct from the base of flue, the air supply is taken directly from the top of the structure.

The outline cut in Fig. 4, showing a transverse section of the building, clearly portrays the manner of conveying the air from the apparatus through the stand pipes, and thence by means of branches to the various apartments on each floor, so that an even temperature is secured in all points.

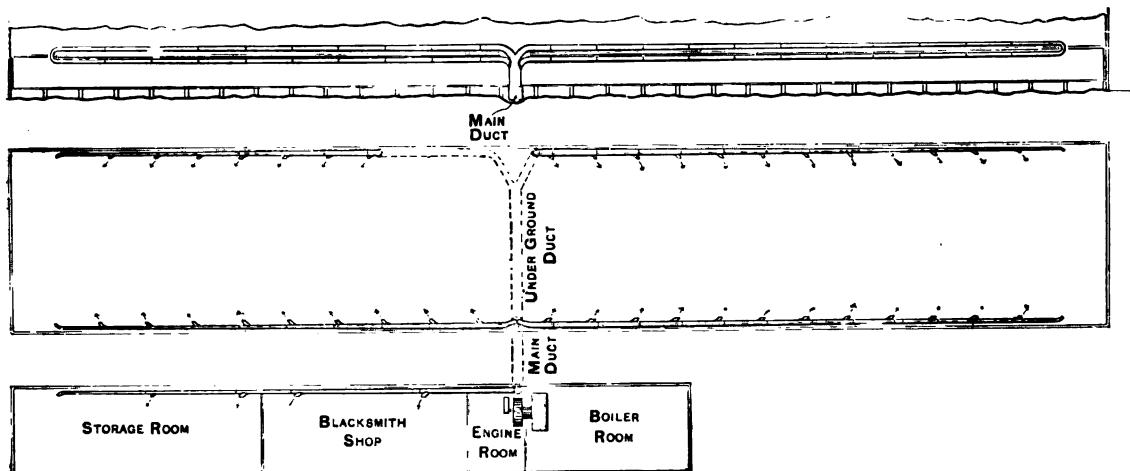
Where a factory is heated by direct steam, the greatest difficulty is experienced, especially in extreme weather, in heating it rapidly in the morning, and after it has become cold through the apparatus not having been operated during the night. The Buffalo Hot Blast System, in this regard, possesses merits yet un-reached by any other form of heating apparatus. It will readily be appreciated that, as the fan delivers enough hot air to each room to effect a change throughout the building every ten to twenty minutes, a comparatively short time is required after the apparatus is started up, even in coldest weather, before the entire space will be warmed to a comfortable working temperature.

Buffalo Hot Blast System of Heating and Ventilating,

Application to the Gallery Type of Factories.



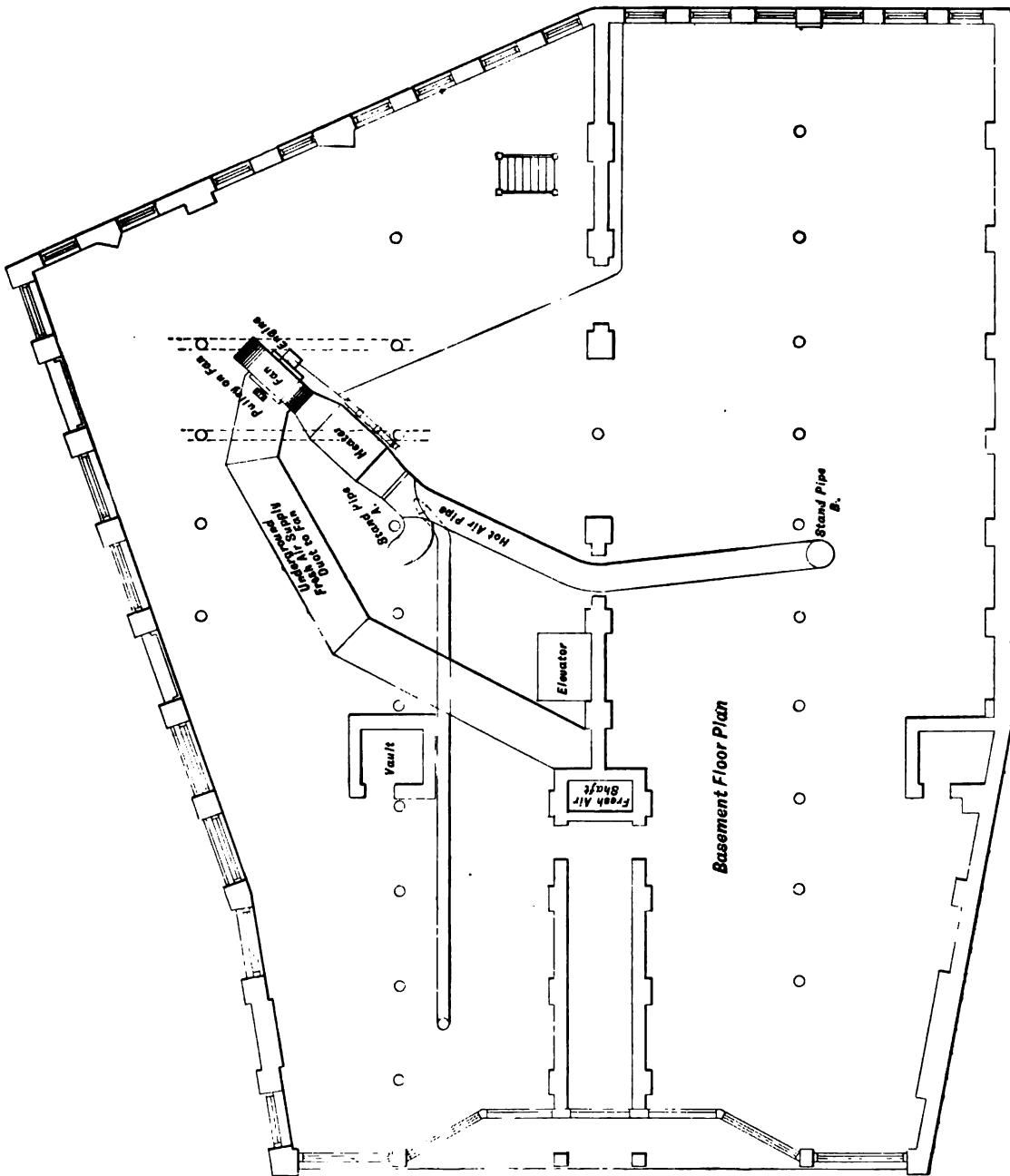
The Gallery Type of Factories. Detail Fig. 1.



The Gallery Type of Factories. Detail Fig. 2.

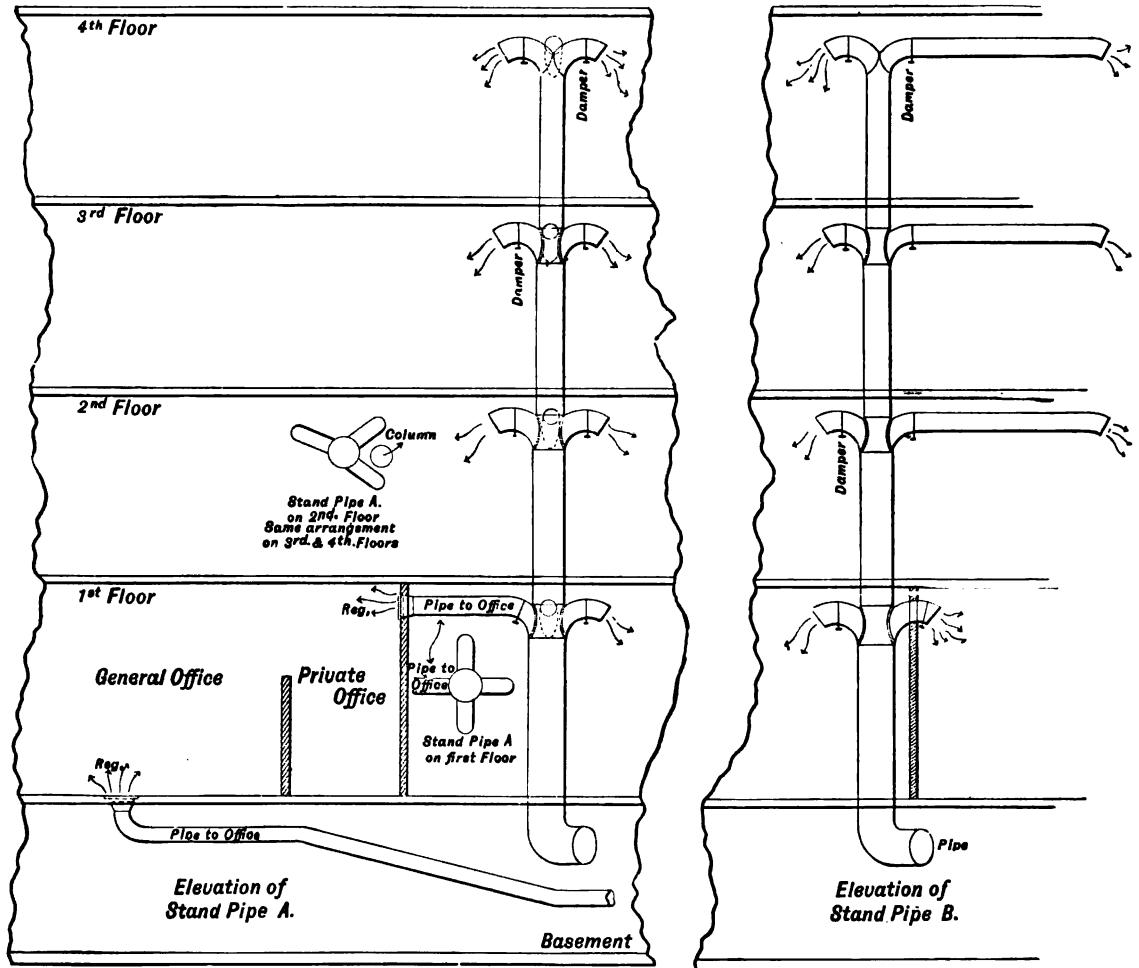
Fig. 5 represents the piping layout used in conjunction with the Buffalo Hot Blast Apparatus installed for heating the shoe factory of Messrs. N. W. Gokey & Son, Jamestown, N. Y. This establishment is one of the largest and most complete of its kind to be found anywhere, and a great number of operatives are employed therein. The apparatus is located in the basement of the building, which is fitted up as a stock room, and a division is also set apart for the factory engine and boilers. Existing conditions rendered it desirable to employ the blow-through type of apparatus, instead of exhausting through the coils, which, perhaps, is more frequently done where the plant is located in a like position, and then with either a top horizontal or up blast discharge of fan. The fan is driven by a direct connected Buffalo Horizontal Engine, and as the exhaust steam therefrom is thrown into the heater, no expense is incurred for motive power for the heating apparatus. The exhaust steam from the mill engine is also utilized to great advantage, and with the exception of extreme weather, the addition of live steam is not required in order to maintain a comfortable working temperature throughout the building.

Buffalo Hot Blast System of Heating and Ventilating, Application to Factories.



Buffalo Hot Blast System of Heating and Ventilating,

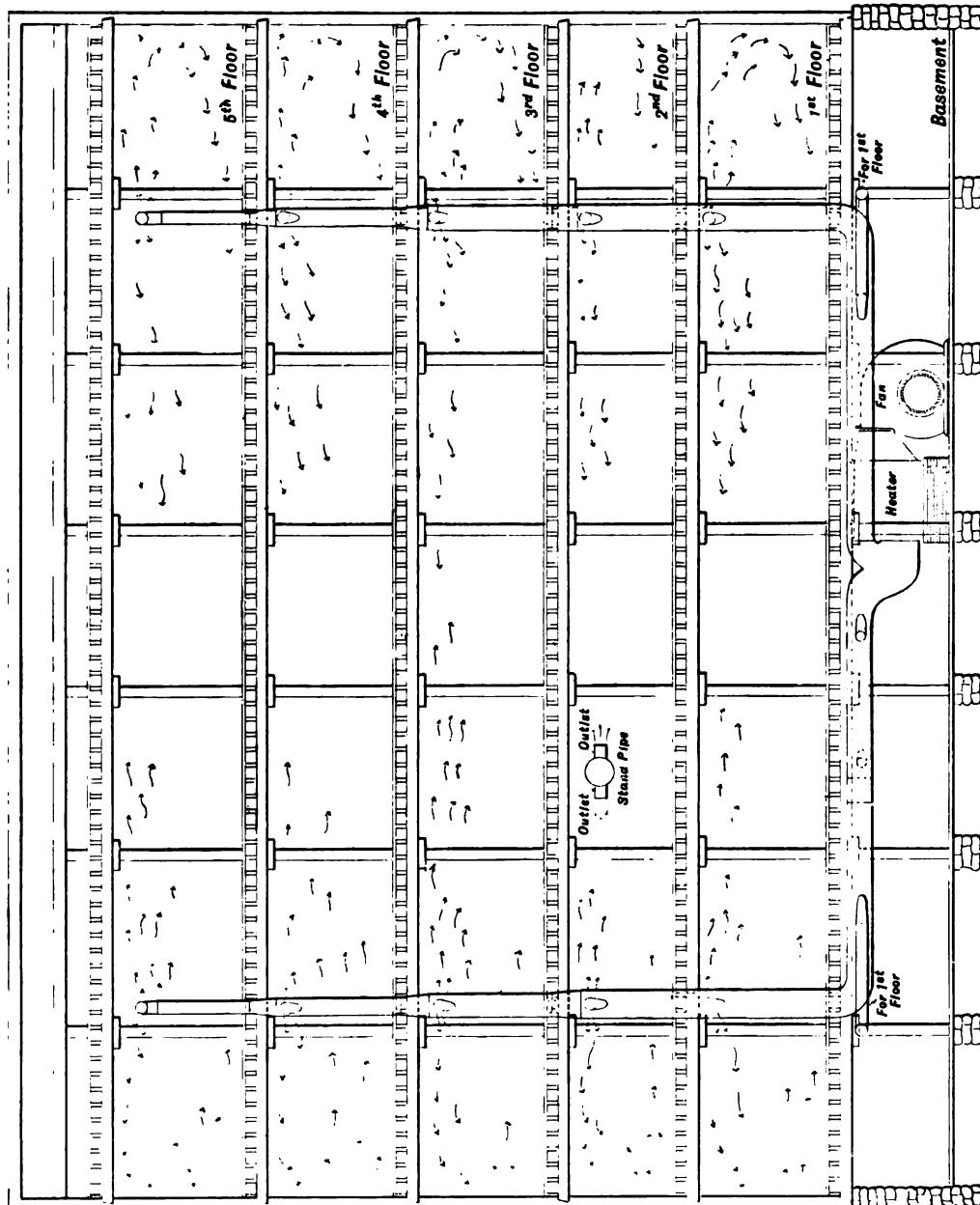
Application to Factories.



Printing House of Hall & McChesney. Detail Fig. 4.

Buffalo Hot Blast System of Heating and Ventilating,

Application to a Shoe Factory.



Shoe Manufactory of N. W. Gokey & Son. Detail Fig. 5.

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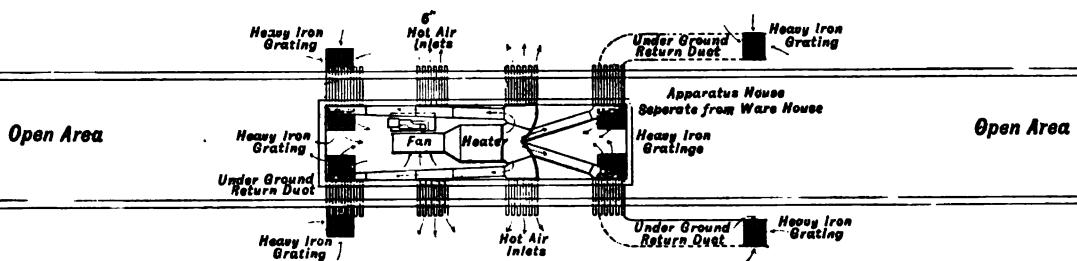
Buffalo Hot Blast System of Heating and Ventilating,

Application to a Bonded Warehouse.



Ware House B,

End View of Apparatus Showing
Hot Air inlets to Ware Houses



Side View Showing Heating Apparatus Building Partially
and also the Side of Ware House A.

Ware House A,

Warehouse of Meadville (Pa.) Distilling Co. Detail Fig. 6.

If the reader is at all familiar with the Hot Blast Heating and Ventilating Plants, he may be at loss to account for the peculiar arrangement of the air pipes applied to the Meadville, Pa., Distilling Co.'s warehouse, which is shown in Fig. 6. In explanation, we may say that, in all bonded warehouses, the Government fixes as a limit a six-inch opening; for this reason, it was not allowable to use a hot air conveying pipe larger in diameter. In order to supply the requisite amount of air, this Government regulation necessitated the use of a sufficient number of small pipes of the above diameter, to equal the efficiency of four larger ones, which would otherwise have been employed in preference, two leading from each side of the apparatus to buildings on either side thereof.

Buffalo Steam Hot Blast Apparatus,

Application to Lumber Dry Kilns.

THE rapid increase and exhaustive demand made by all industries using timber as a basis, has absolutely forced the substitution of artificial drying for the old-time natural process of open air seasoning. By a close study of natural conditions, the construction and operation of the Improved Buffalo Hot Blast Lumber Dryers have been brought to their present advanced and successful stage. The products therefrom fully equal, if not surpass, in quality, the best of the old style methods, and they vastly excel in point of time required to effect a perfect seasoning of timber.

The advantages of the Buffalo Hot Blast System for lumber drying may be further enumerated as follows: Perfect adaptability to kilns of any size, so that any desired amount of dried lumber may be secured per day; entire freedom from fire risk; absolute control of temperature and humidity of air; a heater well adapted for using live or exhaust steam, or both together at the same time; the elimination of back pressure upon an engine when exhaust steam is employed; perfect drainage; utilization of every square foot of heating surface; a strong and uniform circulation of air at all times; no steam pipes in the dry room; no attendant evil results of freezing of water in steam pipes during cold weather, and a minimum expense of operation, the time of drying being far less than with any other apparatus.

The drying of any material is most effectually accomplished when done in the shortest time possible without injury. Scarcely two kinds of material to be dried will receive precisely the same treatment. This is especially true in lumber seasoning. Little observation is needed to see that hard timbers, like oak, ash, hickory, maple, etc., differ materially in the arrangement of their cells or tissues from the soft timbers, such as pine, cypress, hemlock, etc. There is also an intermediate class, for example, poplar, bass, southern pine, and timbers of like nature. The greatest difficulty in lumber seasoning is met in the hard woods first referred to. A successful manipulation of these in drying solves the problem for all the others.

Seasoning or drying of lumber consists in the evaporation of the fluid commonly known as sap from its cells or tissues. During this process they shrink and become hardened, assuming such a position as to render the stock comparatively free from undue after-expansion or displacement, under ordinary exposure to atmospheric influences. With many kinds of wood, the first step in seasoning or drying is the sweating process. It should be continued until the lumber is sweated to its center, when this process ceases and the drying is commenced. Sweating may often be accomplished to advantage by introducing a jet of steam into the lumber dryer.

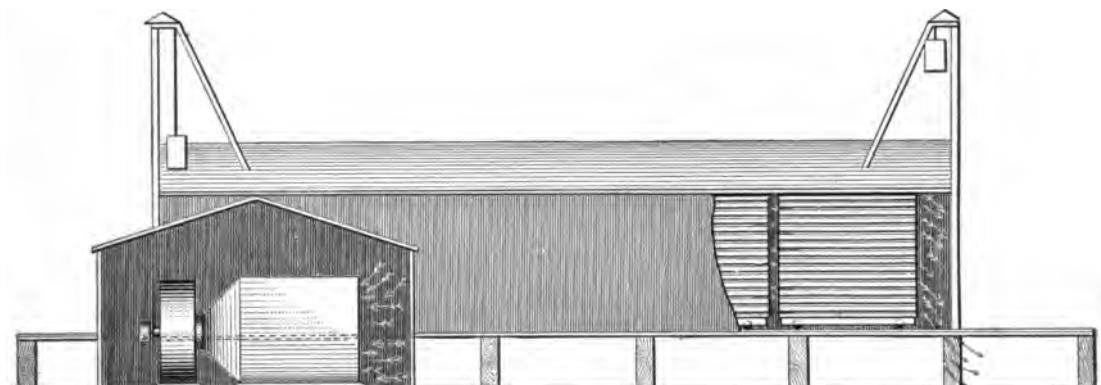
It is a well known fact that too intense heat applied to almost any sort of lumber will cause cracking, checking and warping; this is due to the fact that the cells or tissues are of various degrees of hardness, as caused by the continual growth of the tree. A high temperature causes the more porous cells to expand more readily than the solid ones, thus tearing loose the tylosis or interlocking of fibers, with the attendant result of reducing the resistance strain. By carefully regulating the humidity of the atmosphere, the exact condition of which may be readily ascertained by the use of the hygrometers, this expansion is graduated, and prevents the tearing away of the interlocking fibers.

As will be observed by the table on a following page, the Buffalo Hot Blast Progressive Lumber Dryers are furnished in a large variety of sizes and capacities, suited to every possible requirement. Apartment lumber dry kilns of any desired size and number of rooms can readily be furnished, where desired. The former type is the most popular style of dry room, especially where large quantities of lumber are to be seasoned. As will be readily understood, the lumber is placed into the kiln green at one end upon cars, and gradually is brought into contact with the greatest heat at the other end of the kiln, where, in due course, it is taken out dry. An apartment kiln may consist of any size and shape of room, and of almost any number.

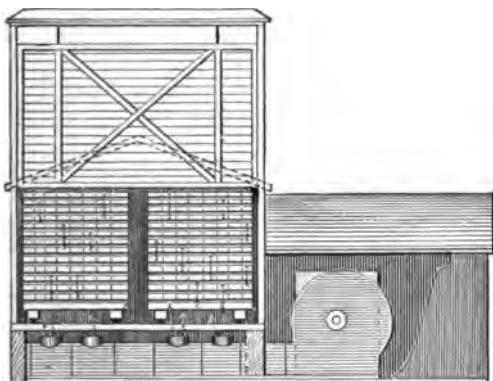
Complete detailed plans of either form of kiln are furnished with every order. Blank forms, upon which may be filled out the necessary data for estimating, will be cheerfully furnished.

Buffalo Hot Blast Progressive Lumber Dryers,

Especially Adapted for Hard Wood Timber.



Detail Fig. 1.



Detail Fig. 2.

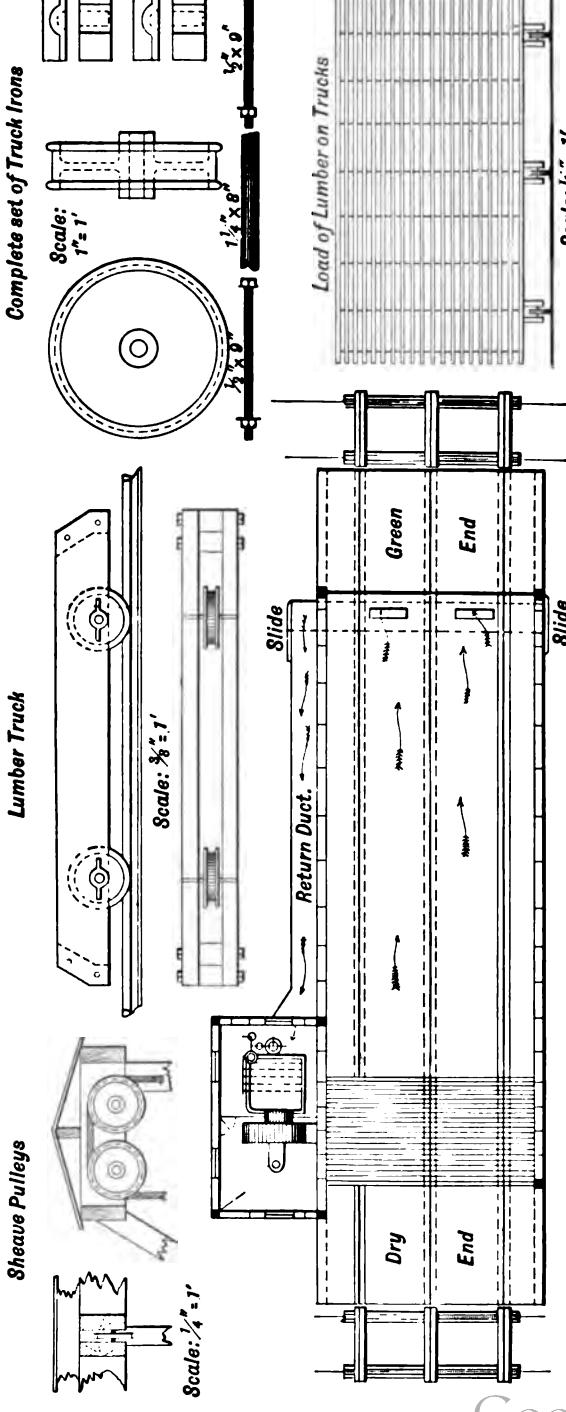
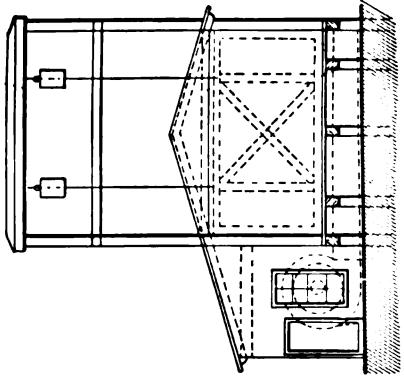
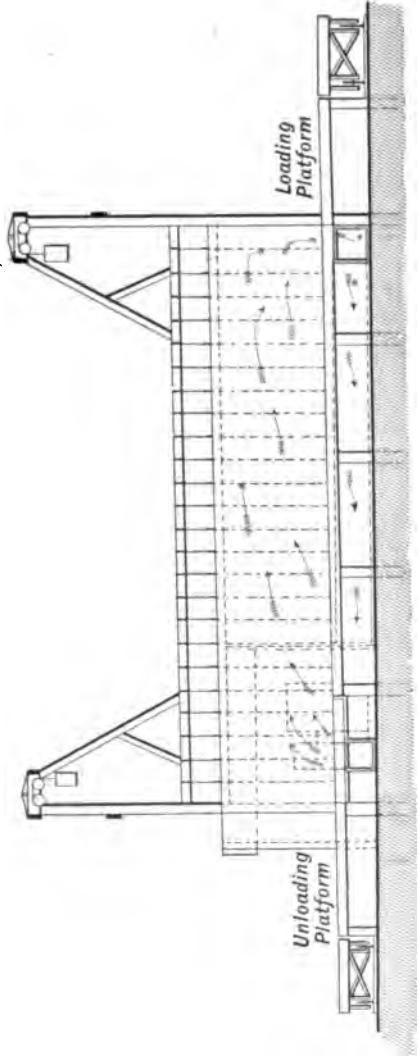
THE cuts herewith presented clearly illustrate the general arrangement of Buffalo Hot Blast Progressive Lumber Dryers, which are especially adapted for hard wood timbers. In Fig. 1, we have a side view of the kiln, with the exhausting type of apparatus applied thereto. The fan delivers the air hot direct to the kiln, it first having passed over the coils of steam pipe, becoming thoroughly heated. The circulation of air through and around the cars of lumber is very plainly shown, and also its exit through the openings at the bottom of the kiln, opposite the end where the heated air is supplied. During the latter stages of lumber drying, and also in handling some timbers, there is economy and great advantage in returning a portion of this air to the apparatus, which may be accomplished by the usual return duct, which is clearly shown in another engraving.

In obtaining the full daily drying capacity of any dryer, much depends upon the man in charge of the kiln. Careless piling of lumber will very materially reduce the efficiency and capacity of an apparatus, and, therefore, care should be taken in loading every car before it enters the kiln, providing proper space between each course of lumber, so that the air may readily have a thorough circulation throughout. Lumber will then be seasoned thoroughly and evenly throughout the entire car.

In Fig. 2, may be observed the outlets of the hot air from the apparatus through the openings provided for the purpose, and the manner in which it is supplied to the kiln. The cars of lumber appearing herewith have gradually been brought in contact with the greatest heat from the opposite end of the kiln where they are first entered. These cuts illustrate a rather small drying arrangement.

Intending purchasers of dry kilns should write for our No. 2 information blank, which, when filled out and returned to us, gives the necessary data for submitting a proposal and specification on a plant suited to every requirement. Drawings, complete in every detail, of all standard kilns tabulated on another page, can be furnished immediately, and are supplied with every order for an apparatus. This house has furnished so large a number of special drying arrangements, that there is scarcely a requirement of this nature but which can be readily met by following the general principle of some existing plant heretofore installed, though some modifications are usually necessary.

Buffalo Progressive Hot Blast Lumber Dry Kiln.



The Various Engravings Illustrate the Details of Component Parts of the Kiln Appurtenances.

Buffalo Progressive Lumber Dry Kilns,

Standard Sizes.

IN THE table which follows, we give three sizes of single kilns which previously have not been called standard dryers. Our wide experience has led to adopting these, as there is considerable demand for kilns of such capacity. The other sizes have been found to be the best adapted for seasoning lumber when the Progressive type of kiln is used. A departure is made in listing the sizes of fans and heaters employed for the different kilns. In this connection, it should be borne in mind that the size of fans, and also heaters, varies with the different kinds of lumber to be seasoned. The apparatus listed is suitable for drying pine and timber of similar requirements. For hard wood lumber it is often found desirable to select a larger size of outfit, or, at least, a larger size fan, dependent upon the amount to be dried in a given time, and the condition of the material when put into the kiln.

SIZE OF DRY KILN		Hold- ING APPAR- ATUS		No. of Drying Rooms		Size of APPAR- ATUS		HOLD- ING CAPA- CITY OF KILN		For Two Tracks in Kiln		For Three Tracks in Kiln		Size of FAN IN INCHES		WORK COMPLI- ANCE AND IRON PRICE APPAR- ATUS, F. HEAT- ING SURFACE.			
Kiln Type	Doublle Kiln	Kiln Type	Double Kiln	Size of Each Room in Feet	No. of Drying Rooms	Horse Power in Feet	Feet per Hour	Width of Kiln	Width of Kiln	Width of Boxes and Trunks	Width of Boxes and Trunks	Width of Boxes and Trunks	Width of Boxes and Trunks	Width of Boxes and Trunks					
Single Kiln	22 x 17 x 9	22 x 17 x 9	22 x 17 x 9	12 x 8	8000	8	16	32	32	84	12	24	48	48	96	8	85	40	500
"	22 x 17 x 9	22 x 17 x 9	22 x 17 x 9	12 x 8	12000	10	20	40	40	84	15	30	60	60	126	8	85	50	1000
"	27 x 17 x 9	27 x 17 x 9	27 x 17 x 9	13 x 8	16000	12	24	48	48	126	18	36	72	72	140	8	85	60	1200
"	33 x 17 x 9	33 x 17 x 9	33 x 17 x 9	13 x 8	20000	14	28	56	56	138	21	42	84	84	169	8	85	70	1500
"	43 x 17 x 9	43 x 17 x 9	43 x 17 x 9	13 x 8	24000	16	32	64	64	150	24	48	96	96	189	8	85	80	1750
"	64 x 17 x 9	64 x 17 x 9	64 x 17 x 9	14 x 10	36000	22	44	96	96	166	33	66	132	132	252	8	85	90	2250
"	85 x 17 x 9	85 x 17 x 9	85 x 17 x 9	15 x 10	50000	28	56	128	128	210	42	84	168	168	315	8	85	100	2675
Two	22 x 17 x 9	22 x 17 x 9	22 x 17 x 9	13 x 8	24000	20	40	80	80	164	30	60	120	120	252	16	170	80	1750
"	43 x 17 x 9	43 x 17 x 9	43 x 17 x 9	14 x 9	50000	32	64	128	128	252	48	96	192	192	378	16	170	90	2650
"	64 x 17 x 9	64 x 17 x 9	64 x 17 x 9	15 x 10	75000	44	88	176	176	336	66	132	264	264	504	16	170	110	3375
"	85 x 17 x 9	85 x 17 x 9	85 x 17 x 9	17 x 12	100000	56	112	224	224	420	84	168	336	336	630	16	170	130	4840
Three	22 x 17 x 9	22 x 17 x 9	22 x 17 x 9	14 x 9	38000	30	60	120	120	252	45	90	180	180	378	24	255	90	2250
"	43 x 17 x 9	43 x 17 x 9	43 x 17 x 9	15 x 10	75000	48	96	192	192	373	72	144	288	288	576	24	255	110	3375
"	64 x 17 x 9	64 x 17 x 9	64 x 17 x 9	17 x 12	110000	66	132	264	264	500	99	198	396	396	756	24	255	130	4840
"	85 x 17 x 9	85 x 17 x 9	85 x 17 x 9	20 x 14	150000	84	168	336	336	625	126	252	504	504	940	24	255	170	6160
Four	22 x 17 x 9	22 x 17 x 9	22 x 17 x 9	14 x 9	48000	40	80	160	160	336	60	120	240	240	504	32	340	110	2625
"	43 x 17 x 9	43 x 17 x 9	43 x 17 x 9	17 x 12	96000	64	128	256	256	504	96	192	384	384	672	32	340	130	4840
"	64 x 17 x 9	64 x 17 x 9	64 x 17 x 9	20 x 14	144000	88	176	352	352	672	132	264	528	528	1008	32	340	170	6160
"	85 x 17 x 9	85 x 17 x 9	85 x 17 x 9	22 x 26	192000	112	224	448	448	840	168	336	672	672	1280	32	340	2-130	7525
Five	85 x 17 x 9	85 x 17 x 9	85 x 17 x 9	24 x 20	240000	140	280	560	560	1050	210	420	804	804	1575	40	425	2-130	9875
Six	85 x 17 x 9	85 x 17 x 9	85 x 17 x 9	26 x 22	300000	168	336	672	672	1260	252	504	1008	1008	1890	48	510	2-150	10750
Eight	85 x 17 x 9	85 x 17 x 9	85 x 17 x 9	32 x 26	400000	224	448	896	896	1680	336	672	1344	1344	2520	64	680	2-170	14515
Ten	85 x 17 x 9	85 x 17 x 9	85 x 17 x 9	36 x 28	500000	280	560	1120	1120	2100	420	840	1680	1680	3150	80	850	3-170	18495

Buffalo Lumber Dry Kilns,

Various Applications.

APARTMENT KILNS.—This type of lumber dryer consists of several or a series of rooms of any desired size, usually governed in form by the lumber to be seasoned, but which are seldom operated upon the progressive principle, though cars are often used therein. For certain service, kilns of this construction afford great advantage, inasmuch as by regulation of dampers provided for the purpose, any desired temperature can be maintained in any of the apartments, without reference to each other. Each room is provided with ventilators for expelling the saturated air, as it is not often that the arrangement will permit of the return duct feature. Where small quantities of different kinds and thicknesses of lumber are to be seasoned, the apartment plan affords very desirable features, and not found in other forms of dryers.

REMODELING OF ORDINARY KILNS.—The Buffalo Steam Hot Blast Apparatus, applied to operate with ordinary or home-made kilns with steam pipes in the bottom, will very materially increase their capacity, and the evenness of drying. Very much smaller heaters are used in remodeling kilns which have been previously piped for direct steam than with the regular progressive dryers, though the size of fan remains practically the same, for a large volume of air is more serviceable in effecting rapid drying than too intense a degree of heat.

LOCATION OF APPARATUS.—What is often the most convenient location for the apparatus, is not always the most advisable. For example, it may best suit the convenience of the engineer in charge to have the apparatus located near the factory engine, while the kiln proper may be at some distance therefrom. To carry the heated air through the intervening distance is not economical, therefore, it is necessary that the apparatus be located in a house especially provided for the purpose, adjacent to the kiln. In cases where this is inconvenient, and it is not desirable to employ the return duct feature, the heater may be placed close to the kiln, while the fan may be located at some distance from it, and blow the air over the intervening space. As the air is cold until it reaches the coils, there is no loss by radiation. It is more economical to carry the steam to a heater thus arranged, than to attempt to carry the heated air over the same space.

ENGINE FANS.—A fan having a direct connected engine or a small independent engine intended for exclusive use of driving it, possesses great advantages, for the reason that the volume of air may be controlled at all times. Warping and checking of lumber are frequently due to sudden changes of temperature in the kiln. Where the kiln is operated only when the factory engine is running and the room allowed to cool at night, much more time is consumed in drying, than when the outfit is run continually where a special engine is provided for the purpose.

GENERAL FEATURES.—Buffalo Steam Hot Blast Lumber Drying Apparatus is especially designed for utilizing exhaust steam from the fan and factory engines, while live steam may be used in the heater at night with the exhaust steam created by the small engine driving the fan. The prime feature of this system is the freedom from fire. The steam pipes are entirely encased in a fire proof jacket of heavy steel plate, and placed in an apartment separate from the drying room. There is no contact of heating surface with wood work. A material reduction of insurance rates is secured by the use of this apparatus, and it is further possible to secure satisfactory rates of insurance where Buffalo Lumber Kilns are located directly inside of factory buildings as an apartment thereof.

This process of drying is adapted to seasoning all kinds of lumber, though various kinds require different treatment. In one case, it will be a high temperature with rapid circulation of a great volume of air, and in another a lower temperature, but the same large quantity of air. For hard wood lumbers, such as oak and hickory, the latter is especially advisable. The return ducts in drying hard wood lumber, whereby a portion or all of the air may be returned to the apparatus, are desirable, for the reason that with once passing through the lumber complete saturation does not take place, and a certain degree of humidity is valuable in opening the pores and softening the outside of the lumber, so that the inside moisture can find its way to the surface. Hygrometers are indispensable for determining the exact humidity of the air, and should be a feature of every complete kiln.

Buffalo Steam Hot Blast Apparatus,

For Special Lumber Dry Kilns.

THE special dry kilns furnished by this house for seasoning lumber in particular forms, are of original design and construction. The introduction of the Buffalo Hot Blast Apparatus into various wood working industries has marked a great advancement in the time and efficiency of their drying arrangements.

Timber in the form of veneers, shingles, staves, heading, material for carriage wheels, kindling wood, etc., has been most successfully handled by this system, though the arrangement generally calls for some uncommon form either of the construction of the apparatus itself, or the drying room. For the seasoning of the materials above referred to, either the progressive dry kilns or the compartment type can be used, this being determined by the nature of the stock, care required in handling and the time allowed for drying.

In all lumber dry kilns, sufficient care ordinarily is not given to the proper piling of timber upon the trucks provided for the purpose, or, where the use of these are dispensed with, the arrangement of it in the compartment kilns. Apparently, operators lose sight of the point that, to dry evenly and thoroughly, the entire surface should be exposed to the heat and air. The lumber when dried, if properly handled without checking or warping, assumes the same shape as the one in which it enters the dryer. Whether the material is regular 1 inch stock or material as thin as veneers, or thick oak planks, equal care should be taken in every instance to see that the air and heat can readily be brought into contact on each side. The piling sticks separating the different courses of lumber never should be less than $\frac{1}{4}$ inch thick and even greater for lumber of increased thickness.

Many of the above materials are dried progressively, and when regular lumber dry kiln trucks, illustrated on a previous page, are not suitable to hold the stock, cars are built with latticed sides and bottom, making a convenient receptacle for admitting the material into them. The ends of the cars are so constructed that they may be let down, and thereby allow the easy removal of the load. Cars of this type are the acme of convenience for handling wooden material in small pieces, such as kindling wood, shingles, etc.

BUFFALO TOWER DRY KILNS.—A number of years ago, this house conceived the idea of employing a dry kiln built in the form of a tower, for seasoning staves, stock for butter tubs, wooden pails, etc. The first kiln of this form consisted of one single tower, and was in every way so great an improvement over previous drying rooms for similar work, that considerable study and experiments were made upon this form. The later plants have been composed of a number of towers, grouped together. Their size and proportions are, like nearly all special forms of dryers, dependent upon the character of the material to be seasoned, desired daily capacity, and other existing conditions. The towers are built from 6 to 8 feet square, and from 20 to 40 feet high; in order that the stock may be easily taken out at the bottom without loss of heat, from the doors being opened too great a length of time, the floors of all tower kilns are built inclined. Where the material being dried is of very heavy nature, and liable to break ordinary wooden supports, iron work is employed. As the hot air enters from directly underneath the dry room, the floors necessarily must be latticed, and by employing iron the net work may be much more open, with the attendant result of reducing the obstruction to the free passage of air to a minimum. The floors of the tower are built sufficiently on an incline that the material must necessarily slide out easily when the side doors of the kiln are opened. In this form of dryer, the material is thrown in at the top usually from a certain story of the manufactory, the kiln being built conveniently adjacent thereto, and as dried stock is taken out at the bottom it gradually comes in contact with the greatest heat, as it works its way downward. The hot air in its passage upward comes in contact with all the pieces, and escapes at the top. In some dryers thus erected, arrangement has been made for warming a certain portion of factories in winter by the discharged air. It is often the case that saturation of the air is so great in dryers of this nature, that it is unfitted for such service, unless its discharge into the room to be heated will not injure the contents.

Application has also been made to tower dryers whereby the material enters at the bottom, and gradually passes up to the top by means of endless chains with satisfactory results.

Buffalo Progressive Hot Blast Brick Dryers.

WHILE the description which follows refers more particularly to the drying of brick and tile, any clay product may be most successfully and economically dried with the Buffalo Hot Blast System. The use of these outfits ensures great saving in labor over other methods. The manner in which the air and heat are applied eliminates checking produced by other forms of dryers.

Until the introduction of this apparatus for drying brick, clay, tile and similar material, there has been no efficient, reliable or economical system upon the market. Furnace dryers in almost unlimited numbers and forms have been tried, with the result, in the majority of cases, of the brick and other material being seasoned previous to burning, cracking to so great an extent that the loss is a considerable item. The nature of some clay is such that it is an utter impossibility to dry it by such forms of dryers, and a case seldom occurs where there is not a large percentage of loss. This is due entirely to the fact that green clay products cannot be brought into such intense and dry heat without attendant results as above. This feature is entirely overcome in the Buffalo Progressive Brick Drying System. Another point, which every brick plant owner who has employed a dryer of this form will readily acknowledge, is the exorbitant cost of maintenance, especially in the matter of fuel. There is not the faintest suspicion of economy in any of these dryers. Direct steam pipes have also been employed with results, which, if not quite so disastrous as in the other case, certainly have been found extremely unsatisfactory, and the working of such a dryer which is reliable, economical and performs the work evenly, is yet unknown.

The unparalleled success of Buffalo Hot Blast Brick Dryers is due solely to our experts in charge of their placing having a thorough knowledge of the composition and properties of various clays in different sections. Scarcely two dryers are built precisely alike in length, height, arrangement of air ducts, or relative proportions of fan and heater capacity, unless used in one yard for the same clay, for the reason that an outfit perfect for drying in one instance would be a failure in others, because that same form, size and method of operating the dryer would crack the brick. In view of this, we make it a point to visit every party desiring to install an efficient dryer, and personally examine the clay before submitting a proposal. We have ample facilities for making tests in hot blast drying of any clay that, upon examination, may appear to require a special treatment. The clay found in some of the extreme Western States is of such composition that tests are invariably necessary before the proportions for a successful dryer can be decided upon. Buffalo Hot Blast Brick Dryers have been most efficiently applied for preparing brick for burning in these points where it is utterly impossible to dry either in open air or by any existing type of dryer. Colorado air, on account of its dryness, is especially trying to brick drying operations, on account of the large losses by cracking and checking, but the application of the Buffalo Hot Blast System of Drying eliminates all of this annoyance.

A large number of our dryers may also be seen in operation in nearly all sections, drying clay products of such nature that it has been impossible to successfully handle in the open air with most favorable conditions. Any other form of dryer applied to such clay would ruin every brick brought into the tunnels.

The advantages of Buffalo Hot Blast Progressive Brick Dryers may be enumerated as follows: By their use it is possible to dry the entire output of a plant per day, regardless of the weather; they afford the brick manufacturer full control of his operations, so that a certain output may be depended upon in a specified time, the same as in any other line where work is performed under cover. Winter or summer, rain or snow, in no way affect the capacity of the dryer. Far less space is consumed than in drying a given number of brick per day with any other dryer. The cost of running expenses is reduced to a minimum and guaranteed lower than with any other apparatus. Exhaust steam is utilized to the greatest advantage, and, in many cases, sufficient is created by the large engine to render the addition of live unnecessary. The exhaust steam from the fan engine is also employed in the heater, entailing no cost of motive power for the apparatus. The dryer is adapted to any size or capacity from 10,000 to 300,000 brick per day.

Buffalo Progressive Hot Blast Brick Dryers.

BY VARIOUS experiments in drying brick, it has been demonstrated that to rapidly and successfully evaporate the excessive moisture present, it is imperative that a large amount of air be brought into contact therewith. Probably very few materials to be dried contain a greater amount of moisture than brick, and to rapidly carry it away the employment of a fan which will deliver a very large volume of air under a positive pressure, is required. To accelerate the drying process to the greatest possible extent, sufficient heat is combined with the air to secure the highest efficiency.

That this house has furnished and erected the only entirely successful hot blast or fan system brick drying outfit, is a simple matter of record. Numerous Buffalo Dryers are in daily use through the various sections of country, all giving results unattained by any other form of dryer yet produced. In no single instance, has a Buffalo Hot Blast Progressive Brick Dryer been placed which did not dry more brick than was guaranteed as its capacity within a given time. Intelligent handling of the plants, after those in charge had become familiar with their details, has enabled operators to secure from 10 to 35 per cent. more brick per day than the owners were informed the outfit would produce.

The Buffalo Hot Blast Apparatus has also been most happily applied to existing forms of brick dryers, common examples being those having direct steam pipes. While the amount of material dried in a remodeled dryer will naturally be far below that derived from the same amount of space devoted to the progressive type, such plants have been made very satisfactory to their owners.

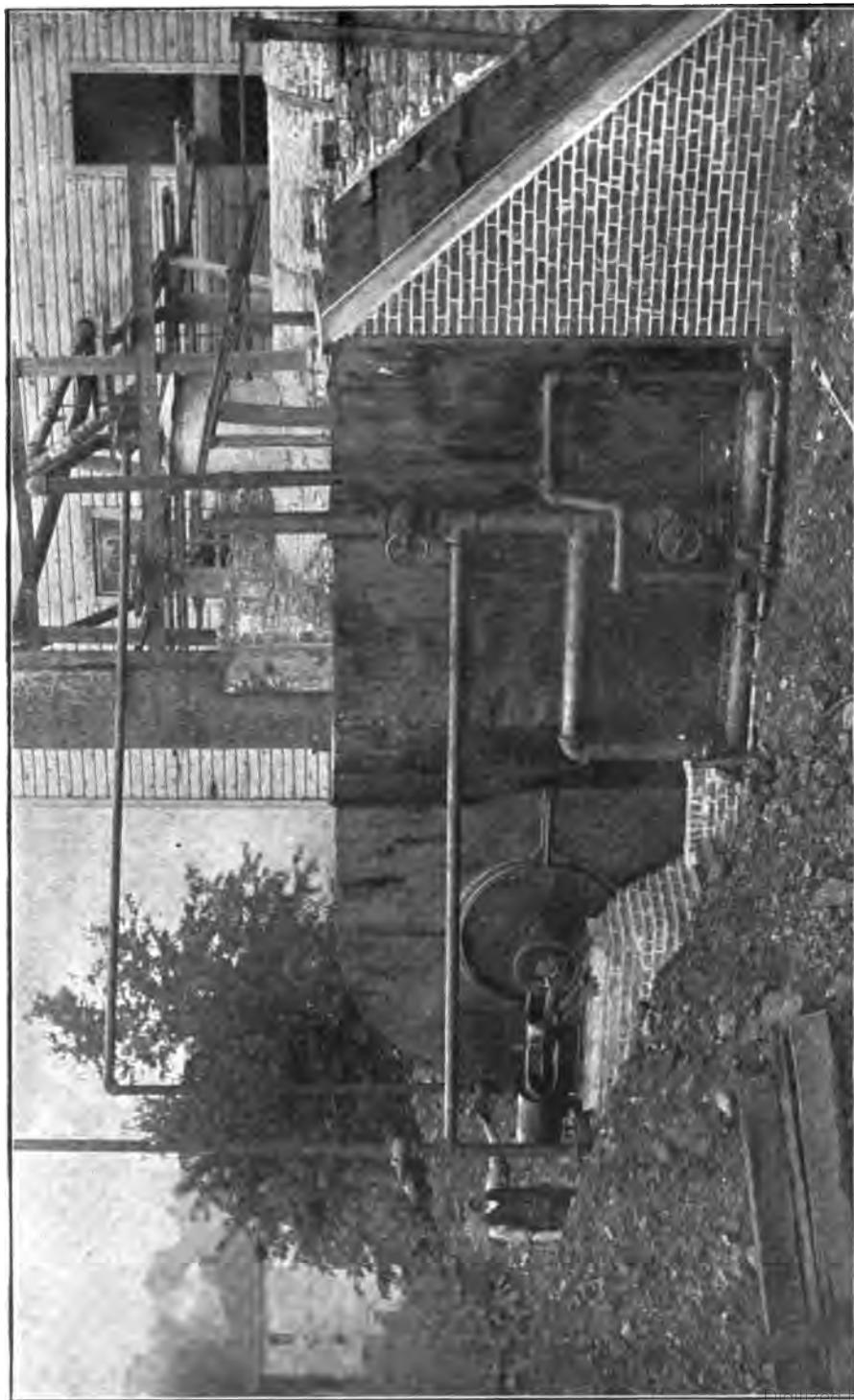
Fan system brick dryers of other construction may be observed in different sections. In some cases, it will be found that the attempt is made to dry the brick or clay with steam pipes used in conjunction with the disk or ventilator type of fan applied directly to blow over the coils. The efficiency of such dryers is exceedingly low, being scarcely better than furnace or direct radiation types. When the matter is looked into carefully, no other result could justly be expected, when the fact is taken into consideration that such a fan cannot overcome the resistance offered by the steam pipes, to say nothing of the closely piled brick and tile in tunnels. Hot blast dryers of the same general appearance as the apparatus built by this house for its celebrated brick dryers, have occasionally been observed by our representatives, but in no single instance has a fan system outfit been found (excepting those operated by a Buffalo Hot Blast Apparatus) which is daily drying the amount of brick guaranteed as its capacity. This point is called attention to with no egotistical spirit whatever, but as a portrayal of the simple facts which are further susceptible of proof. A most thorough investigation of every form of dryer upon the market is earnestly requested from those who have occasion to install an apparatus of this sort, and an honest comparison will substantiate our claim of having unquestionably the best upon the market from every point of view.

It is not the custom of this company to offer, as an inducement for securing contracts for brick drying apparatus, the lowest priced plant. It is true that the first cost of a Buffalo Hot Blast outfit will average much lower than many furnace and direct steam dryers, claiming to have the same capacity, but which, at the best, do not perform the work easily or without checking the material. There are others, still less to be desired, which in first cost are much lower. Other fan system apparatus are frequently offered, but invariably the capacities thereof are too small to accomplish the drying of a given number of brick demanded in a stated time. Improper relative proportions between the fan and heater exist in all other fan dryers, which, undoubtedly, is due to unfamiliarity of their manufacturers with the requirements of different clays.

No intelligent buyer will expect a 6-foot fan of one manufacture to produce the same results as a 10 or 12-foot machine of another. It is most befitting that, before making an acceptance of a proposal, the detailed dimensions and capacity of an apparatus be fully examined into, and it be ascertained, by investigation, the amount of material being dried with the same size of apparatus in operation elsewhere.

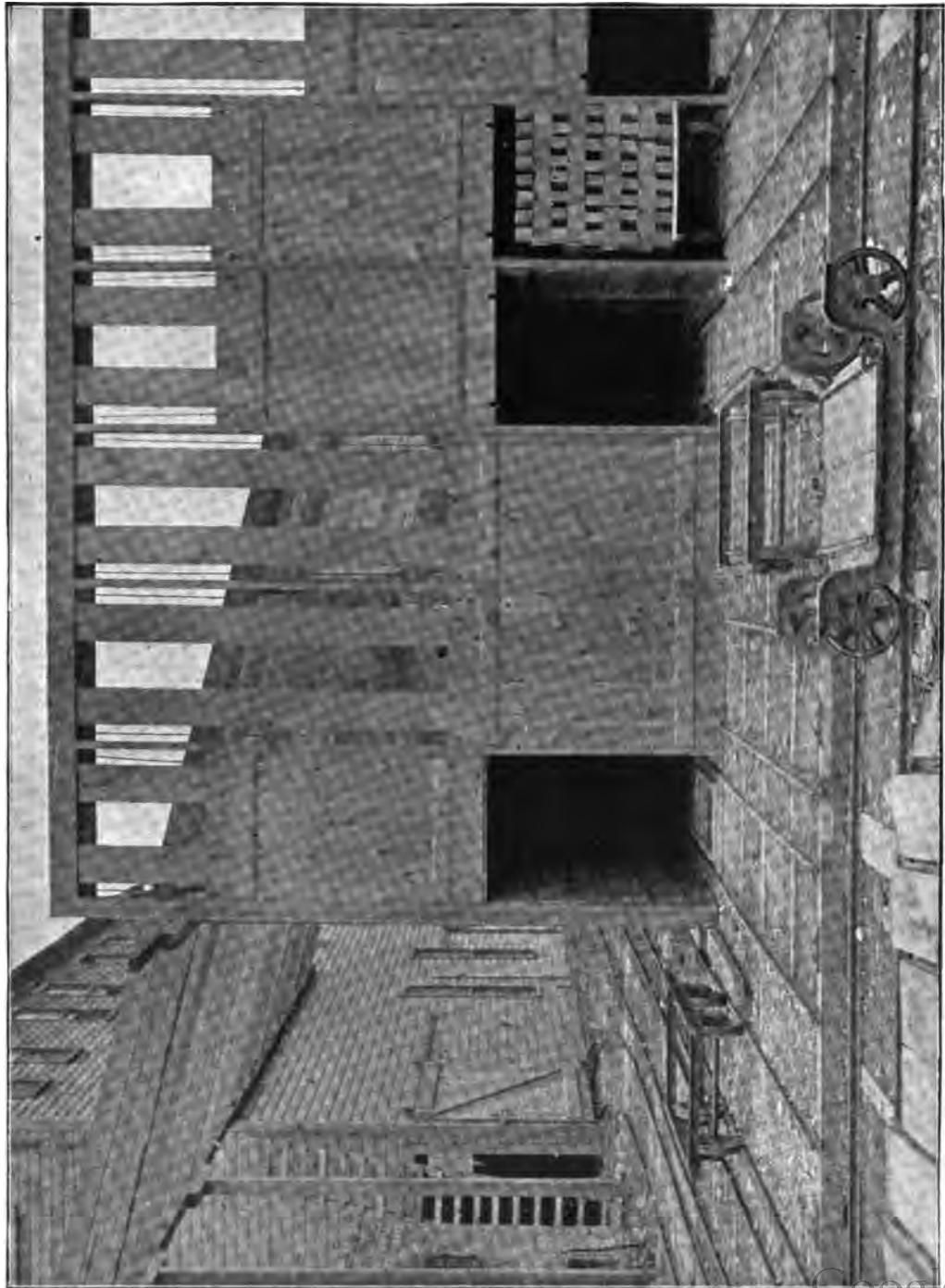
The unparalleled success of the Buffalo Hot Blast Apparatus is primarily due to a thorough knowledge of the requirements attendant upon the drying of different varieties of clay in all sections. Upon this entirely depends the number, length, height and width of the tunnels, the proper point of introducing the heated air, and, above all, the amount of air and temperature at which it is introduced. In its turn this determines the relative proportions of the fans and heaters employed for a dryer of given capacity.

Buffalo Hot Blast Progressive Brick Dryer.



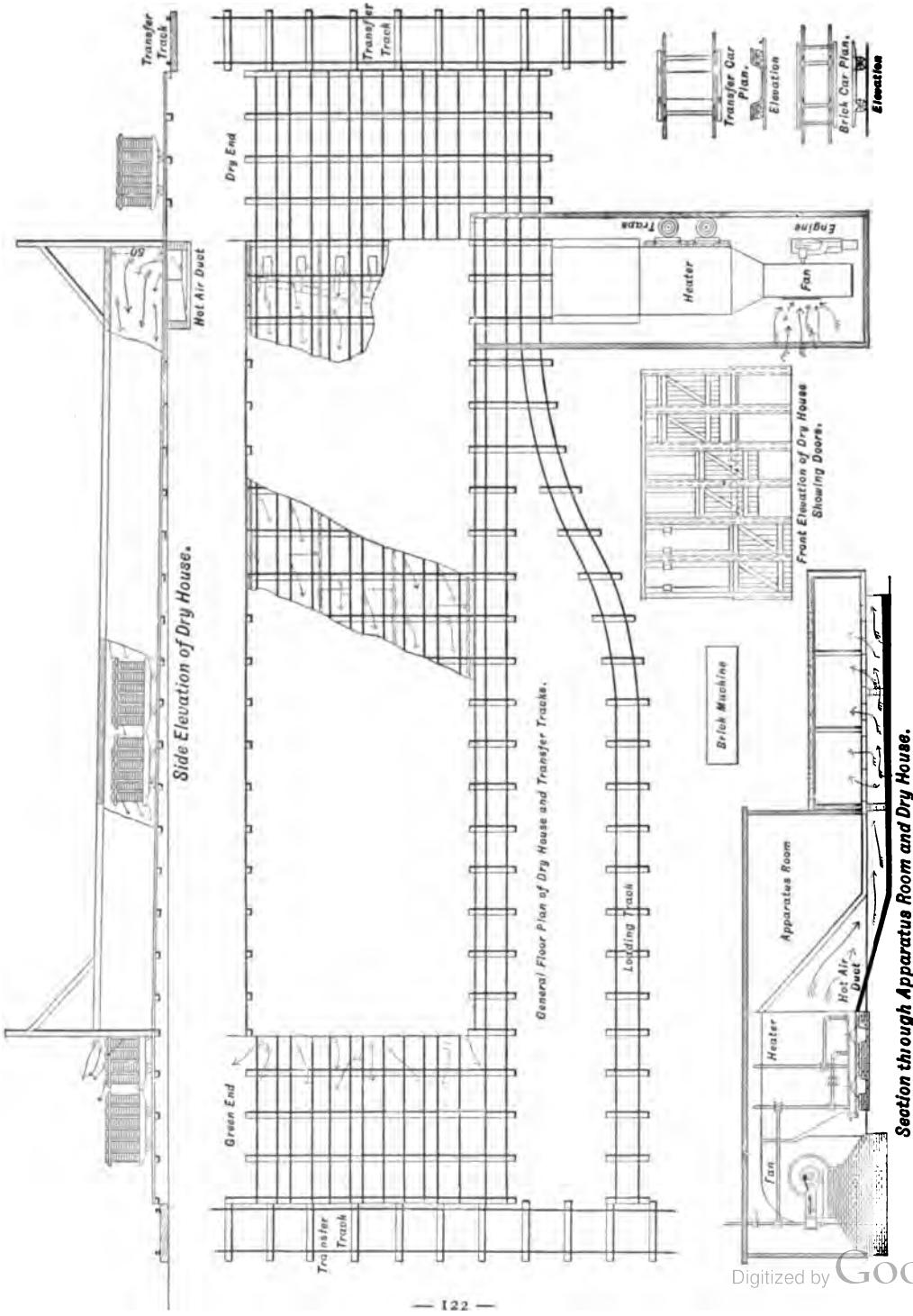
From Photograph of Dryer in Process of Erection at Hornellsville Brick, Tile and Terra Cotta Co.'s Yards, Hornellsville, N. Y. Fig. I.

Buffalo Hot Blast Progressive Brick Dryer.



From Photograph of Dryer in Course of Erection at Hornellsville Brick, Tile and Terra Cotta Co.'s Yards, Hornellsville, N. Y. Fig. 2.

Buffalo Hot Blast Progressive Brick Dryer.



Hornellsville Brick, Tile and Terra Cotta Co.'s Outfit. Detail Fig. 3.
through Apparatus Room and Dry House.

Buffalo Hot Blast Progressive Brick Dryers.

ON PREVIOUS pages we illustrate, by half-tone engravings, Figs. 1 and 2, a Buffalo Progressive Hot Blast Brick Dryer in course of erection at the yards of the Hornellsville Brick, Tile & Terra Cotta Co., Hornellsville, N. Y. The illustrations are presented, not for the purpose of showing the construction of the apparatus, but as being an actual representation of a plant in course of construction.

In Fig. 1 are shown the fan, engine and heater with the steam connections leading from the boiler and large engine thereto, partially completed. As will clearly be seen, the blow-through type of apparatus is employed, and for certain clay and other conditions in brick drying it possesses advantages not embodied in the exhausting type. At a given number of revolutions, a blower handling cold air will deliver a much greater amount of air than a fan exhausting through the heater, handling the air hot, for the reason that air expands after becoming heated. Again, the air is not agitated by the fan after passing through the heater, which further adds to the efficiency of the apparatus, as to agitate the air, cools it to a certain degree. Acting as a blower, the possibility of the fan bearings becoming heated is precluded. As is clearly shown, the air is conveyed from the heater proper with a down discharge made of brick and wood. This leads directly to the underground duct which in Fig. 2 is observed with the several air discharges into the individual tunnels. The duct leads to the tunnels, in Fig. 2, directly underneath the return track at the left of the engravings. The dryer has a listed drying capacity of 20,000 common building brick per day. With nothing more than the ordinary handling, it has produced upwards of 25,000 brick in the same time without crowding.

Upon the opposite page we show, in Fig. 3, an outline cut, giving the general details of the arrangement of the plant. This outfit is a six-track dryer, each apartment being 75 feet long.

Every efficient brick dryer necessarily must be built especially for the clay which is to be handled, and the air ducts require particular arrangement for each different plant. These points are absolutely necessary, for the reason that some clay will dry without damage in a great heat, while other qualities require different treatment as there would be great loss by checking. Any experienced brick manufacturer will appreciate the cogent point that a thorough knowledge of the composition and properties of various clays is indispensable to its successful handling in drying. The engineers who invariably oversee the planning and installation of all Buffalo Brick Dryers are those who have been connected with the business for years and are familiar with the characteristics of different clay found through the United States.

In Buffalo Progressive Hot Blast Brick Dryers of various capacity, the tunnels are from 55 to 90 feet in length, and may be constructed either of wood or brick. Each tunnel is built of the proper width for one car of brick, tile or other material, which moves upon two tracks gradually from the green end to the hot end of the dryer. The outfit may consist of any desired number of tunnels from 4 to 20, according to the capacity of the dryer and the material to be handled. For easily moving the cars of brick, the tracks in the dryer should be built on a slight incline; a pitch of 1 inch to every 6 feet will suffice.

This house makes a specialty of supplying complete apparatus for brick drying plants, consisting of its regular Hot Blast Apparatus, i. e., fans, engines, heaters and traps, standard "T" rail, improved Buffalo brick cars (a line of which is illustrated on following pages), cable or wire rope, sheave pulleys and the usual other appurtenances for tunnel doors, etc. The extended experience gained in the application of this system of drying of all varieties of clay products, including the most delicate, and also the expensive art work produced by renowned potteries, leads us to request customers, who may have any special material to be handled, to make inquiry of us as to where a Buffalo Hot Blast outfit for the same general service may be seen in operation. Upon receipt of such request, the necessary advice will be supplied, together with a complete estimate and proposal.

No standard lists of dryers and apparatus required therefor is presented herewith, as tabulated for other uses to which the Buffalo Hot Blast Apparatus is adapted. This is due to no oversight, but to the fact the great variations in the requirements of different clays make it impossible to compile such a table.

Buffalo Improved Brick Cars, For Conveying Tile, Brick, Etc.

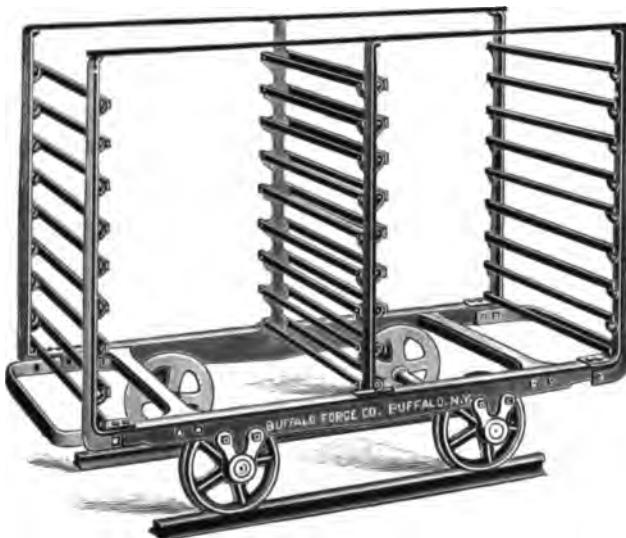


Fig. 1.



Fig. 2.



Fig. 3.

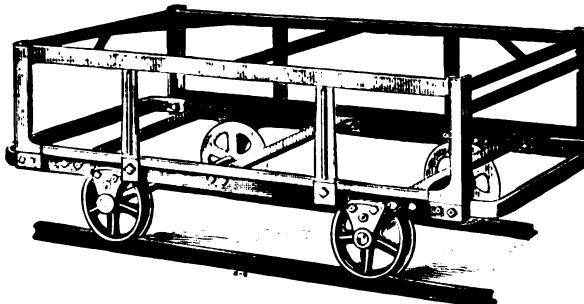


Fig. 4.

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Buffalo Improved Brick Cars, For Conveying Tile, Brick, Etc.

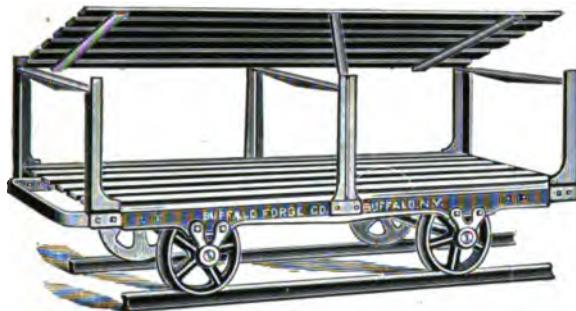


Fig. 5.



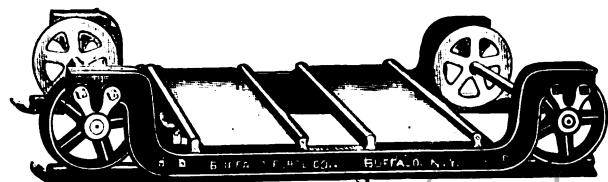
Fig. 9.



Fig. 6.



Fig. 7.



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Buffalo Improved Brick Cars,

For Conveying Brick, Tile, Etc.

AS WILL readily be appreciated, the Improved Buffalo Brick Cars are unsurpassed in design, and are the most convenient extant. The journals are of simple design, made on the ball-bearing principle; this feature renders them decidedly the best of any on the market, and especially suited for conveying brick and other heavy material, for with the friction being reduced to a minimum they run very easily; very little oiling is required. The bumpers are made of the best wrought iron and project 2½ inches over each end, allowing of sufficient space between the cars for the air currents produced by the Buffalo Hot Blast Apparatus to circulate freely. They also act as binding braces, the spring taking off the jar and strain when cars come suddenly together, and likewise prevent jamming together of the brick and tile on separate cars. With many forms of construction, this feature is entirely unprovided for, and the attendant result is that repiling is often necessary. The weights of Buffalo Improved Brick Cars are guaranteed, and the strength proportionate. It will be an error on the part of the consumer to undertake the use of lighter cars having holding capacities as stated, for the reason that, with the hard knocks brick cars are constantly receiving, they would be soon rendered useless.

Fig. 1 shows the pallet type, where a board pallet can be used with or without bumpers. This iron rack car is a very strong and convenient one, and well adapted for carrying soft mud brick.

Fig. 2 represents a flat car without bumpers, reducing its cost somewhat. If desired, it may be used for pallets where they have risers at the end. In Fig. 3 we have the same car as is shown in Fig. 2, with the exception that it is provided with bumpers.

In Fig. 4 we illustrate an eight-post double deck car, which is adapted for carrying all kinds of soft mud brick. It is especially suitable in such cases where the brick are not strong enough to hack on a flat car. It is made to hack the brick three tiers high on the lower section, and four above, if desired. Fig. 5 illustrates a double deck car of the three-post type. The deck may be made either of wood or angle iron, as desired, and operated by lifting it as shown in the cut, when loading and unloading. In Fig. 6 an iron rack pallet car, intended for carrying soft mud brick and used where five brick are made in a mold, is shown. The same car is also adapted and extremely serviceable for carrying fine pressed brick.

A first class transfer car is indispensable, especially where brick or tile are dried under a Buffalo Steam Hot Blast Progressive Drying System. We unhesitatingly recommend the one illustrated by Fig. 7, as being the finest and strongest transfer car upon the market. Fig. 8 is a good illustration of the Buffalo Double Transfer Car, suitable for carrying two loaded or two light cars, or a light and loaded car at the same operation.

The convenience of a turntable is never appreciated until they are once used. The Improved Buffalo, illustrated by Fig. 9, is made in one solid piece of iron, cannot get out of order and will last a life time. The disk plate works perfectly on a pivot center bearing, and is further supported and revolves upon eight outer wheels.

PRICE LIST AND CAPACITIES OF BUFFALO IMPROVED BRICK CARS.

No.	No. of Brick Holding Capacity	DIAMETER		WEIGHT	GAUGE BETWEEN TRACK RAILS		PRICE
		Length	Width		24½ in.	24½ "	
1	432	6 ft. 6 in.	40 in.	540	24½ in.	24½ "	\$16.00
2	504	6 " 9 "	35 "	300	24½ "	24½ "	10.00
3	504	7 " 3 "	35½ "	290	24½ "	24½ "	10.50
4	504	7 " 3 "	35½ "	410	24½ "	24½ "	11.75
5	504	7 " 3 "	35½ "	410	24½ "	24½ "	12.15
6	504	7 " 6 "	35 "	600	24½ "	24½ "	17.50
7	1 car	5 feet wide		450	4 ft.		18.00
8	2 cars	5 "	"	575	4 "	4 "	22.00
9	1 car	Diameter 4 feet		500			16.00

Buffalo Steam Hot Blast Apparatus,

For Special Drying Work.

STARCH DRYING AND CRUSTING.—Beyond any question, it has been conclusively demonstrated by existing Buffalo Hot Blast Apparatus, daily operating for this service, that they possess merit unequaled by any form of dryer upon the market. The work is performed in a thoroughly systematic, efficient and economical manner, and the dryers are so constructed that opportunity is afforded for the inspection of the material during the drying process. These dryers have been introduced into a number of the foremost starch manufactories, and the experience of those who have substituted the Buffalo Hot Blast Apparatus for steam pipe coils or other drying apparatus is that the work is accomplished in a great reduction of time, while the cost of drying has been reduced in some instances more than 60 per cent., and the quality of the stock vastly improved.

In one of the very largest starch manufactories in this country the exclusive drying outfit consists of a Buffalo Hot Blast Apparatus. The former time of drying and crusting, under the most favorable conditions, was six days. By the application of this apparatus it has been reduced to twenty-four hours. The material handled is in the form of 7-inch cubes. The method of application of the system to the work is peculiar, and originated by this house. At the outset, a dryer of average size was installed as an experiment, and as it proved so eminently successful, this system for the entire works was afterwards adopted.

LEATHER, SAND PAPER, WALL PAPER, FABRICS, WOOD FIBRE, ETC.—In drying leather by the Buffalo Hot Blast System a great amount of time and labor is saved, and the material assumes a color which it is impossible to secure in any other method of drying. Furthermore, the leather is cured evenly. There is no accumulation of leather in drying lofts during unfavorable weather. The rooms are thoroughly ventilated by the system and without injury to the stock. A high velocity of air and too intense a degree of heat in leather dryers cause a depreciation in the value of the stock by reason of its assuming a dark, dull color, and otherwise injuring its texture. The Buffalo Hot Blast Apparatus applied and operated in accord with our instructions entirely obviates this feature. All air ducts are of large area, and the fan is invariably run at a slow speed.

In drying cloth, where applying the system to tentering machines, the old steam pipe dryers are dispensed with. The apparatus is separate from the tenterer, but arranged for convenient manipulation.

For the drying of large varieties of yarn, knit goods, silks, and especially in steam laundries, an even and positive circulation of warm air is indispensable, and this can only be secured by the use of a fan system apparatus. There are several forms adapted for the arrangement of drying, each dependent upon the work to be accomplished and the material handled. In print mills, and also oil-cloth manufactories, no discoloration of the goods is effected while drying by this system. For drying the metal work coming now into such popular favor for interior decorations, these outfits are especially suited, as has been shown by their being installed with unequalled success.

Goods made up of wood or paper pulp, either in the form of basins, pails, pans, etc., are economically and rapidly dried by the application of the Buffalo Hot Blast System. They are usually piled upon cars, and the apartment kilns afford advantages equal to the progressive plan.

DRYING SALT AND OTHER GRANULAR SUBSTANCES.—The first thoroughly efficient and satisfactory Hot Blast Salt Dryer was designed and built by this house a number of years ago. With slight changes in form, a number of these dryers have been constructed for various leading concerns, giving results by far in advance of any arrangement heretofore brought to notice. Sugar, fertilizers, grain, malt, and all materials of granular form, may be equally well dried, without injury, in this manner. Drying cylinders are employed for a number of these special arrangements, according to the peculiar requirements of the different substances handled. Air is admitted at a moderate or high velocity, according as the material will stand, and the degree of temperature is also regulated in a like manner.

Buffalo Steam Hot Blast Apparatus,

For Special Drying Work.

COTTON, SILK AND WOOLEN STOCK.—Previous to the introduction of Buffalo Hot Blast Apparatus for this service, difficulty has been experienced in uniformly and rapidly drying this material. Inasmuch as the difficulty has laid in the want of a sufficient volume of air, it has been a very easy task to accomplish. The table or bench form of dryer is usually employed for the above service, and also for drying hair, rubber, pine fibre, jute, etc. The material is so placed upon the screens that it is thoroughly opened up and exposed to the strong currents of the warm air. Naturally, the length, form and arrangement of the screens or racks will depend upon the existing conditions. The air from the Hot Blast Apparatus is forced under positive pressure into the drying room directly underneath the material, and the continuous operation of the fan compels it to pass directly up through the material. A favorite custom is to have two, or a series of rooms of the same dimensions, and after filling one room then apply the heat, preparing the others in the same manner. When a given stated amount is to be dried in a specified time, provision may be made for accomplishing such service, and the arrangement designed to suit the convenience of the operator.

TOBACCO CURING.—This work may be admirably accomplished by the use of the Buffalo Hot Blast Apparatus with positive benefit to the appearance and quality of the product. The apartment dryer is very convenient, and generally the best adapted to the work. After filling one of the rooms, heat and air from the apparatus should be turned on very lightly (and this point may be regulated to a nicety by dampers), gradually raising the temperature, and at the same time increasing the current of air until the material is thoroughly cured. In no case should heat be allowed to exceed 135°. There is much difference in the climates also in the soil that tobacco is grown upon, and this, coupled with the fact that there are different species cultivated, renders it necessary that the man in charge of the dryer exercise his own judgment as to the time of increasing the heat and volume of air to each apartment; closely observing the results obtained, will soon teach the operator how fast to open the dampers. These plants have been installed in a large number of drying rooms, and found to excel by far any existing form of dryer.

Where the dryers are operated upon the progressive system, which is equally well suited when properly managed, the temperature at the entering point should not register, on an average, higher than the above named, while at the opposite end, it will be lower, and the same results will be secured by gradually bringing the material into the greatest heat, as is referred to for the apartment plan. The dry rooms are so constructed that by closing certain air ducts the tobacco can be sweated as much as the master of the situation desires. He can also have uniform cures in all kinds of weather, inasmuch as perfect and positive control of the temperature and humidity of the air is always afforded.

Tobacco manufacturers well appreciate the fact that the ordinary apparatus for drying readily burn the tobacco, and destroy essential oils. When cured by this process, in accord with instructions furnished with each apparatus, the tobacco is always left with a much richer aroma, and is given all the qualities of the sun-cured product, together with a color of the best flue or barn-cured tobacco, and, what is more, the work is accomplished in a minimum space of time.

When asking for estimates upon dryers intended to be applied for any of the work herein referred to, the quantity to be dried should always be stated, together with the size of room which it is desired to use, the quality and condition of material before entering the dryer, whether it is to be thoroughly dried or to be removed before this is effected, whether live or exhaust steam will be used in the heater, and whether a pulley or engine fan is preferred. With every order for an apparatus, complete drawings showing arrangement of the special drying outfits will be furnished, together with plans for erection of the outfit.

Buffalo Disk Wheel,

With Overhung Pulley.



Especially Suited for Cooling, Ventilating and Drying.

Buffalo Pulley Disk Wheels,

Price List on Next Page.

FOR the various uses to which a Disk Ventilating Wheel may be adapted, it is at once evident to those who will examine into the construction of the Buffalo that in all points it stands at the head.

Of two fans which move the same quantity of air with the same power, if the fans are of the same diameter, the one is best which runs at the slower speed. As an agent for moving air, and speaking of the comparative value of fans, the one is considered best which, under similar conditions, moves the most air with least power. That the construction of Buffalo Ventilating Wheels is such as secures absolutely the best results for all general uses, has been proven by many test competitions. These have been conducted by leading experts and professors. Aside from theoretical tests, numerous instances may be cited where in practical work for various uses Buffalo Disk Wheels have supplanted other types which were found to be inefficient in that they could not be made to move the same amount of air per horse-power in a given diameter of fan.

Public buildings afford, perhaps, the best opportunity for severe and critical tests of the efficiency of a disk ventilating wheel. As substantiating our claims for unsurpassed efficiency, we cannot be otherwise than pleased to refer intending purchasers to various noted buildings where Buffalo Ventilating Fans have been selected without regard to cost, as being the best construction extant. Examples of such buildings are: the Chicago Auditorium, Chicago, Ill.; Drexel Building, Philadelphia, Pa.; City Hall, Richmond, Va.; McLeod Hotel, Dallas, Texas; Tacoma Hotel, Tacoma, Wash.; N. Y. C. & H. R. R. Union Depot; Michigan Asylum for Insane; Public School buildings in Buffalo and other large cities.

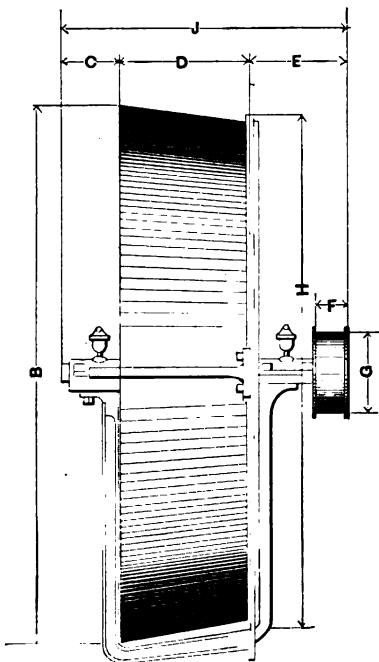
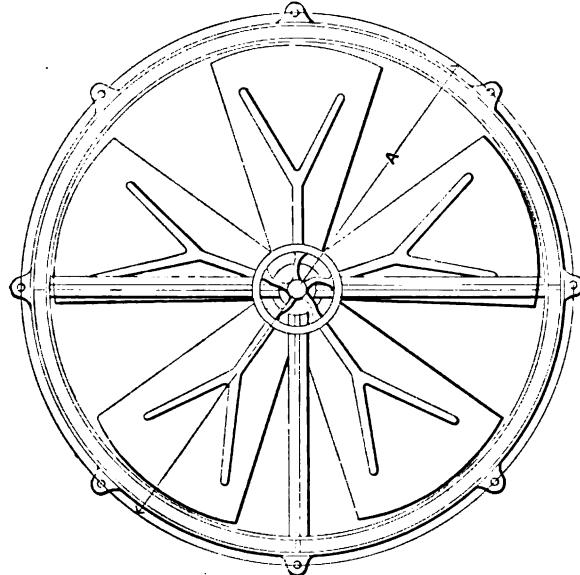
That there is advantage in a fan having adjustable blades, claimed by some manufacturers, is nothing short of a delusion. It has been conclusively proven, both by tests and continued service, that such fans are liable to get out of balance and therefore will not run smoothly.

As the efficiency of a ventilating wheel for all uses largely depends on its being properly applied, we are always pleased to give patrons the benefit of our extended experience in this line of work, if furnished with complete data as to conditions, surroundings, amount and kind of work desired to do, etc.

After many years of costly experiments and tests with various designs of blades for disk wheel construction, it has been demonstrated that a design founded on the well-known principle of mechanics, the inclined plane, will deliver more air with the same amount of power applied, than any other. By an ingenious system of balancing used only in the construction of Buffalo Disk Wheels, we are enabled to secure smooth running even when driven at a high speed. As near as possible the center of gravity coincides with the center of motion. As may be clearly seen, the making of the blades or spider requires the greatest skill of any part of the wheel, and we spare no pains or expense to the end of securing a perfect machine.

Buffalo Disk Wheels are very stiffly braced in every part, the strength of vein and blade being sufficient for the hardest kind of service. They are particularly adapted to such uses as require the movement of large volumes of air where there is free delivery to and from the fan, and in consequence no great amount of resistance to overcome. We guarantee Buffalo Ventilating Wheels to be capable of moving a larger amount of air in proportion to power expended than any other wheel of same diameter on the market, and to be perfectly noiseless in operation. They are also inexpensive, and, being light, of handy form and simple in construction, in many instances are more readily adapted to the work to be performed. Each machine is fitted with a self-oiling device which permits the wheel to be left without attention for a long period—an especially valuable feature when used in cupolas, leather drying lofts or other places not easy of access. For price list and table of dimensions, see next page.

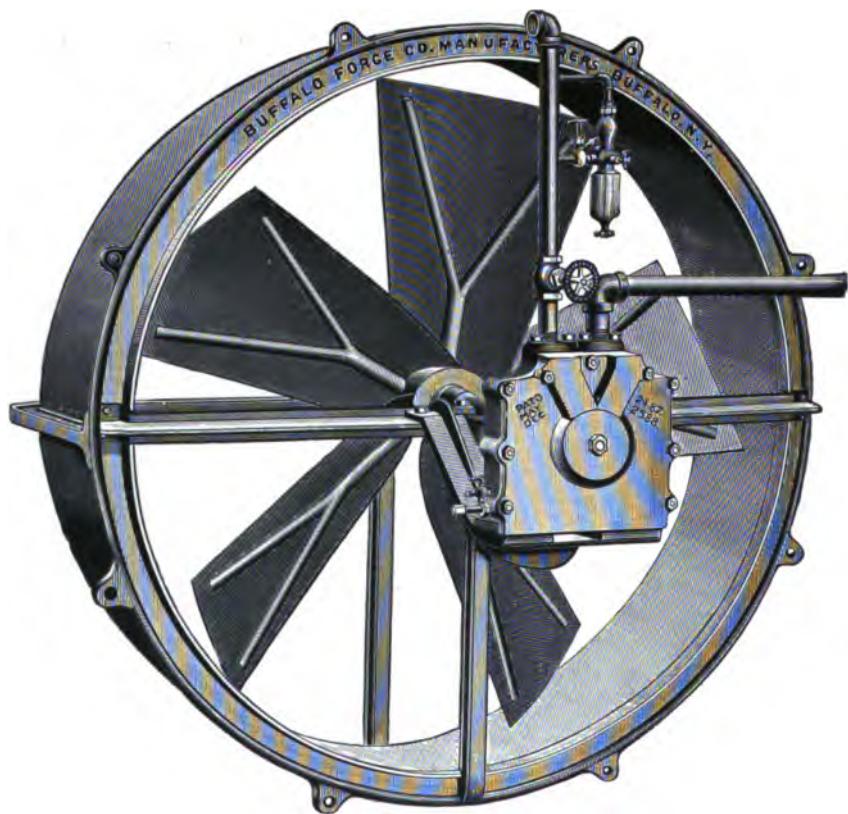
Buffalo Pulley Disk Wheels.



PRICE LIST WITH TABLE PRINCIPAL DIMENSIONS IN INCHES.

SIZE	A	B	C	D	E	F	G	H	J	WEIGHT		PRICE
										Packed	Not Packed	
18	23 $\frac{1}{4}$	20 $\frac{1}{2}$	4 $\frac{1}{2}$	5 $\frac{1}{4}$	7	2	4	19 $\frac{1}{4}$	17 $\frac{1}{4}$	90	75	\$ 40.00
24	28 $\frac{1}{4}$	25 $\frac{1}{4}$	4 $\frac{1}{2}$	6 $\frac{1}{4}$	7 $\frac{1}{4}$	2	4	25 $\frac{1}{4}$	19 $\frac{1}{4}$	115	100	50.00
30	36 $\frac{1}{2}$	33	5 $\frac{1}{2}$	9	7 $\frac{1}{4}$	2	6	32 $\frac{1}{2}$	22 $\frac{1}{4}$	190	170	65.00
36	42 $\frac{1}{4}$	37 $\frac{1}{2}$	5 $\frac{1}{2}$	9 $\frac{1}{2}$	8 $\frac{1}{4}$	3	7	38 $\frac{1}{4}$	23 $\frac{1}{4}$	250	230	85.00
42	48 $\frac{1}{4}$	45	5 $\frac{1}{2}$	12	9 $\frac{1}{2}$	3 $\frac{1}{2}$	8	43 $\frac{1}{4}$	27	350	325	110.00
48	57 $\frac{1}{4}$	53 $\frac{1}{2}$	6 $\frac{1}{2}$	13	11 $\frac{1}{2}$	4	9	52 $\frac{1}{2}$	30 $\frac{1}{2}$	475	445	125.00
54	64 $\frac{1}{4}$	61	7	15	12 $\frac{1}{4}$	4	9	59	34 $\frac{1}{4}$	595	560	175.00
60	69 $\frac{1}{4}$	66	7 $\frac{1}{2}$	17	13 $\frac{1}{2}$	5	10	64	37 $\frac{1}{2}$	670	630	250.00
72	82 $\frac{1}{2}$	80	7 $\frac{1}{2}$	22	15 $\frac{1}{2}$	5 $\frac{1}{2}$	12	76	45 $\frac{1}{2}$	870	820	300.00
84	95	92 $\frac{1}{2}$	8	27	17 $\frac{1}{2}$	6	14	89	52 $\frac{1}{2}$	1050	990	350.00

Buffalo Steam Disk Wheel.



Double Reciprocating Engine Attached Direct to Fan Shaft.

Buffalo Steam Disk Wheels,

Engine Attached Direct to Fan Shaft.

TO RENDER the use of a Disk Wheel feasible for such buildings as have ample boiler capacity but little power to spare, also for locations where to transmit by belt connections would be expensive in first cost, to say nothing of subsequent maintenance, we have designed a High Speed Direct Connected Engine, illustrated on the preceding page. These engines are constructed with special reference for disk wheel propulsion, and occupy but little space though driving the fan at high speed without appreciable noise or vibration.

Their appearance is neat and compact, and they require but little attention to keep in running order. These engines are not of the rotary type, as their appearance at first glance might indicate, but a perfect double reciprocating engine, and occupying much less space than engines of the rotary form. They are also self-contained. They are durable, and cost little for repairs. Four years service at high speeds and nearly constant use during the time, has demonstrated their superior qualities in this respect.

The engine is double reciprocating, with two pistons, and will work as well in one position as another, which feature especially commends their being placed in positions impossible to reach with belt transmissions.

The engine is placed in a casing, which also holds the rectangular piston to move backward and forward horizontally. This piston has a chamber in which an inner piston is mounted in a center on a crank pin projecting through a slot in the back blade of the outer piston, the crank pin being secured to a crank disk on the inner end of the main driving shaft.

Naturally, an engine directly attached to a fan should have no dead center to overcome in starting, and we, therefore, have incorporated this desirable feature in its construction.

There are only two bearings in the body of the engine, the main journal and the crank pin. These are in the form of bushings and are made of the best quality of phosphor bronze. From the manner in which the steam is applied to the moving parts, they are less liable to wear than in the ordinary engine.

The economy of moving a given volume of air under lower pressure by a large fan, as compared with the movement of same volume under a higher pressure by a smaller fan, cannot be questioned, as the power required is always much greater, often double, as compared with the increased amount of air handled. It is, therefore, evident that true economy can best be attained by a fan which will move a certain amount of air at an average speed, thereby saving the running expenses necessary for additional power to drive the smaller wheel up to the same capacity.

The table of dimensions appearing on a foregoing page, and applying particularly to the Buffalo Pulley Disk Wheels, will also serve for the engine fans, the only variation being the width over all. The distance "E," being seldom required will be supplied, on application, together with all other necessary data.

PRICE LIST BUFFALO DISK WHEELS WITH ENGINES ATTACHED.

Diameter of Wheel in Inches	Size of Steam Pipe in Inches	Size of Exhaust Pipe in Inches	Price	Diameter of Wheel in Inches	Size of Steam Pipe in Inches	Size of Exhaust Pipe in Inches	Price
18	$\frac{1}{2}$	$\frac{3}{4}$	\$110.00	48	1	$1\frac{1}{4}$	\$230.00
24	$\frac{1}{2}$	$\frac{3}{4}$	120.00	54	1	$1\frac{1}{4}$	355.00
30	$\frac{3}{4}$	1	160.00	60	1	$1\frac{1}{2}$	415.00
36	$\frac{3}{4}$	1	175.00	72	$1\frac{1}{2}$	$1\frac{1}{2}$	500.00
42	1	$1\frac{1}{2}$	210.00	84	$1\frac{1}{2}$	$1\frac{1}{2}$	540.00

Buffalo Electric Disk Wheel.



Electric Disk Wheel, Motor Connected Direct to the Fan Shaft.

Buffalo Electric Disk Wheels.

THE rapid gain in popularity of electricity as a motive power is continually making the convenience of Buffalo Electric Ventilating Wheels better appreciated. As shown by the engraving, the electric motors are built as part of the fan, and require only minimum power for driving. Nothing can approach them in adaptability to all locations and for all ventilating purposes. To start or stop is merely a matter of adjusting a switch or pushing a button, and neither engine nor belt is required. Their operation is unattended with danger.

It will at once be seen that the important question of proper ventilation need not be out of consideration in locations where a boiler and engine could not be placed. Then again, the electric current to drive these fans can usually be obtained from the street wires of the electric light companies at moderate outlay.

For ventilating purposes in dry goods stores, offices, private houses, restaurants and the like, a Buffalo Electric Ventilating Wheel is without question the most effective and desirable arrangement extant. Any position suited to obtain the maximum efficiency of a fan may be employed without affecting the arrangement of the motor. All these fans are of standard high grade, carefully balanced, and the entire outfit designed for quiet running at high speed. The motors are of the most approved style and type, specially constructed for fan propulsion and capable of continuous use with little attention. The high speed at which it is possible to run these wheels gives them large capacity; therefore, a small fan, occupying but little space, can be used to ventilate apartments of considerable size. When running at an ordinary speed, they are noiseless and of no inconvenience.

In the dynamo rooms of electric light plants, the Buffalo Electric Fans are naturally preferred to any other means of ventilation, and render most efficient service. For various ventilating uses on ships they are also particularly suited.

The peculiar construction of all Buffalo Disk Wheels is such that when running at a high speed the blades do not obstruct the light. It will be found that in all of our arrangements for running these fans either with pulley, engine or electric motor, care has been taken to obstruct the light as little as possible. This is a highly essential point, and one in which the large majority of other fans are defective. Some constructions are such that 50 to 75 per cent. of the light is obstructed where the fan is placed in a window frame. Where Buffalo Ventilating Wheels are desired with the motor connected directly to the shaft of fan, full data must be given of the work to be performed.

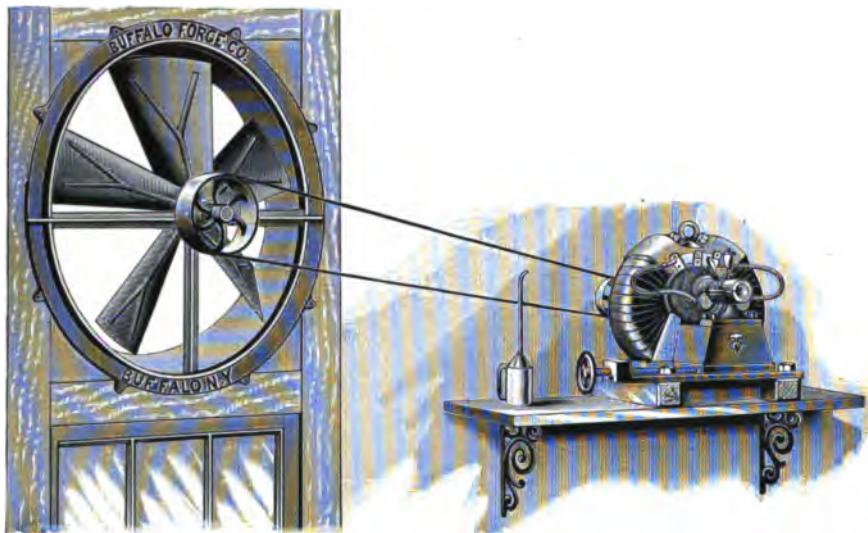
The table of dimensions appearing on a foregoing page, and applying particularly to the Buffalo Pulley Disk Wheels, will also serve for the Electric Fans, the only variation being the width over all. The distance "E," being seldom required, will be supplied on application, together with all other necessary data.

PRICE LIST, SIZES AND DIMENSIONS.

DIAMETER OF WHEEL IN INCHES	PRICES FOR MOTOR CONNECTED TO FAN SHAFT	PRICE OF INDEPENDENT ELECTRIC MOTOR
18		1 H. P., \$ 32.00
24		1 " 90.00
30		1 " 130.00
36	As the size of motor used with	1 " 160.00
42	each fan depends on the speed	2 " 250.00
48	at which it has to run, prices of	3 " 350.00
54	these combinations will be quoted	4 " 410.00
60		5 " 475.00
72	on application.	6 " 556.00
84		7 " 625.00
		8 " 700.00

Buffalo Electric Disk Wheels,

Application of Independent Motor to Fan.



Motor Belted to Fan.

IN THE introduction and erection of Buffalo Disk Wheels to run with electric power, it frequently occurs that, for various reasons, it is desirable to use a motor independent from fans, but located convenient to run by a short belt connection. In most cases, this is the cheapest method of adaptation, and in the large majority of instances, considering all features, it is by far the most desirable.

Buffalo Electric Ventilating Fans, with motor connecting directly to the shaft, are so constructed that two or three rates of speed are placed within command of the operator. In the above arrangement, with the independent motor belted to the fan, we can furnish and attach a cone pulley where so desired and requested in the order, thereby giving a still greater number of different speeds by simply changing the belt from one step of the pulley to the other. Especially where fans are used for furnishing fresh air in winter and for cooling in summer, the above feature of having the rates of speed under perfect control will be found extremely desirable, as at some seasons the highest attainable speed of the fan would reduce the temperature too much. It will readily be appreciated that, by using an independent motor, the amount of air delivered may be regulated to a nicety.

These motors are furnished usually upon an adjustable bedplate, as illustrated, the use of which permits the slack in belts being instantly taken up while the fan is in motion, by means of the adjusting screw.

In ordering electric fans, it is always necessary to give a detailed description of the results which it is desired to secure, stating the amount of cubic feet of air to be moved per minute, and if to be carried through ducts or pipe connections, plans of same should be forwarded. The voltage of the current under which the motor is to operate should also be mentioned.

Hundreds of Buffalo Electric Ventilating Fans are in operation for various uses indicated in accompanying pages, giving unequalled results. Motors are also widely used for driving the steel plate fans used in conjunction with the regular Buffalo Hot Blast Heating and Ventilating Apparatus described elsewhere.

Buffalo Disk Wheels,

Capacities in Cubic Feet of Air at Different Speeds.

NUMBER OF REVOLUTIONS OF WHEEL PER MINUTE	AMOUNT OF AIR HANDLED IN CUBIC FEET PER MINUTE							
	24-inch	30-inch	36-inch	42-inch	48-inch	54-inch	60-inch	72-inch.
100	...	...	...	...	4245	6059	8887	14936
110	...	...	...	...	4676	6695	9258	16506
120	...	...	...	...	5100	7278	10377	18000
130	...	...	...	...	5530	7807	11024	19688
140	...	...	...	...	5965	8322	11919	21300
150	...	...	...	...	6405	9154	12822	22926
160	...	...	...	...	6851	9792	13733	24566
170	...	...	...	...	7302	10437	14652	26220
180	...	...	...	5038	7758	11008	15579	27890
190	...	...	...	...	5821	8219	11746	16514
200	...	...	3594	5607	8696	12410	17457	31267
210	...	...	3779	5896	9138	13088	18407	32976
220	...	2341	3966	6188	9635	13764	19367	34700
230	...	2457	4155	6482	10117	14447	20334	36438
240	...	2575	4347	6779	10605	15136	21309	38190
250	1307	2696	4541	7079	11098	15822	22292	39956
260	1444	2819	4738	7382	11596	16534	23293	41736
270	1502	2945	4937	7688	12099	17243	24282	43530
280	1561	3074	5139	7906	12609	17938	25289	45338
290	1622	3205	5343	8207	13122	18680	26304	47160
300	1684	3338	5550	8621	13641	19408	27527	48996
310	1747	3474	5759	8938	14165	20143	28378	50846
320	1812	3612	5971	9258	14695	20884	29397	52710
330	1878	3753	6185	9580	15230	21632	30444	54588
340	1945	3896	6402	9905	15770	22396	31499	56480
350	2014	4042	6621	10233	16315	23147	32565	58346
360	2083	4190	6843	10564	16865	23914	33633	60306
370	2154	4344	7067	10898	17421	24688	34712	62240
380	2227	4494	7294	11244	17982	25468	35799	64180
390	2300	4650	7523	11573	18508	26255	36894	66103
400	2375	4808	7755	11915	19119	27048	37997	67985
410	2452	4969	7989	12260	19696	27748	39108	69834
420	2529	5132	8221	12608	20278	28554	40227	71650
430	2608	5298	8464	12958	20845	29467	41354	73433
440	2688	5466	8706	13311	21457	30295	42489	75183
450	2770	5636	8950	13867	22055	31112	43632	76900
460	2853	5808	9197	14026	22658	31944	44783	78594
470	2937	5982	9446	14388	23268	32783	45942	80235
480	3022	6158	9699	14752	23884	33628	47109	81853
490	3109	6336	9953	15119	24503	34480	48224	...
500	3197	6516	10210	15489	25127	35328	49467	...
510	3286	6698	10470	15862	25755	36203	50640	...
520	3376	6882	10632	16238	26390	37074	51795	...
530	3468	7068	10897	16616	27030	37952	52832	...
540	3561	7256	11162	16997	27675	38836	54051	...
550	3656	7446	11430	17381	28325	39727	55152	...
560	3752	7638	11702	17768	28980	40624	56225	...
570	3849	7822	11977	18158	29640	41528	57300	...
580	3947	8028	12254	18530	30283	42438	58347	...
590	4047	8226	12534	18945	30909	43355	59376	...
600	4148	8426	12816	19345	31518	44277	60401	...
610	4250	8628	13101	19744	32110	45208	...	...
620	4354	8832	13388	20148	32665	46144	...	...
630	4459	9038	13678	20554	33243	47087	...	...
640	4565	9246	13970	20963	33784	48036	...	...
650	4671	9456	14265	21375	34310	48992	...	...
660	4779	9668	14562	21790	34936	49851	...	...
670	4888	9882	14862	22202	35562	50923	...	...
680	4988	10098	15164	22611	35888	51888	...	...
690	5109	10316	15469	23017	36414	52880	...	...
700	5221	10536	15776	23420	36940	53858	...	...

It is always more economical, in the matter of power, to select a comparatively large fan, which will do the work at a moderate speed, than to attempt to accomplish the same results by driving a small fan at excessive number of revolutions.

Buffalo Disk Wheels,

General Application.

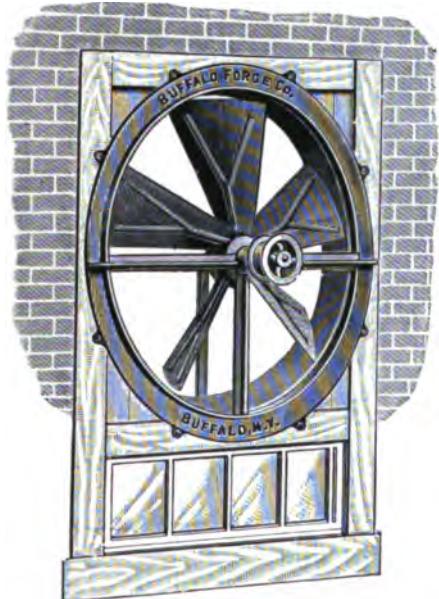


Fig. 1.

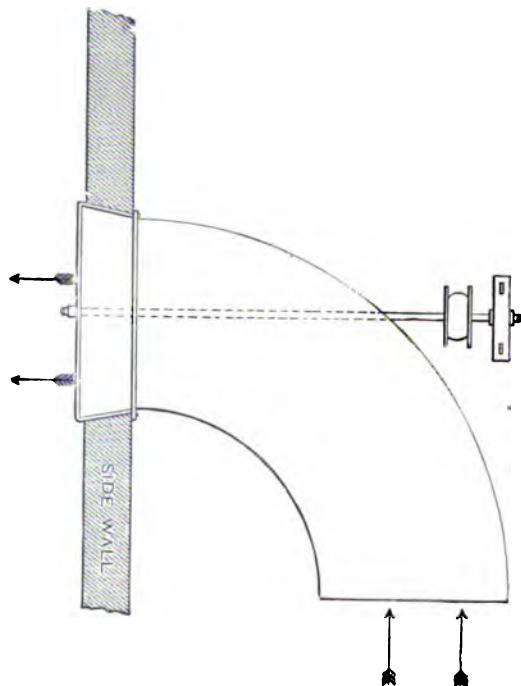


Fig. 2.

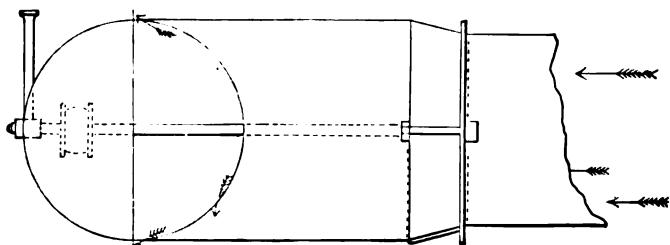


Fig. 3.—Side Elevation.

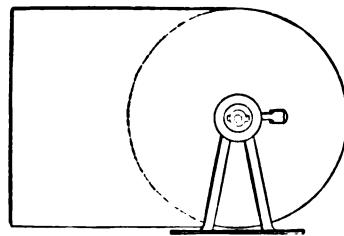


Fig. 4.—End Elevation.

CUT Fig. 1 shows wheel placed inside of a window frame discharging outside of building. This arrangement is specially adapted for factories, engine rooms and other places, where it is desired simply to exhaust foul air, dust, steam, vapor, etc., from the room, and to insure a regular circulation and supply of fresh air in such apartments.

Fig. 2 is a sectional view of an application with Buffalo Disk Wheel in window or wall, discharging outward with pipe connections, as it is often desired to convey the exhaust from inner rooms or section of building through a pipe to outside; all sharp bends or turns are to be avoided.

Buffalo Disk Wheels,

Various Applications.

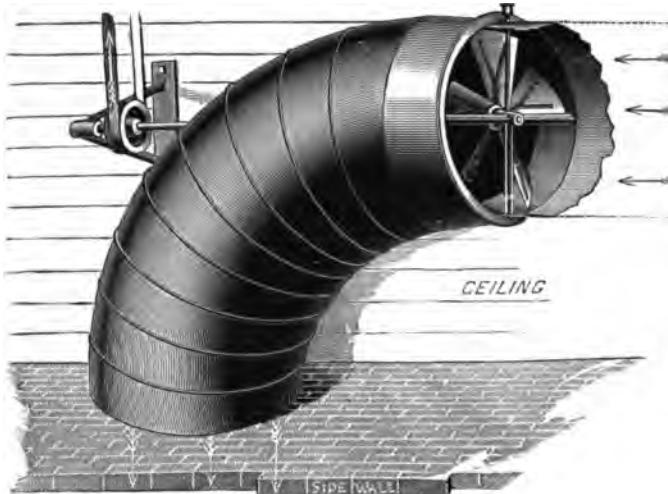


Fig. 5.

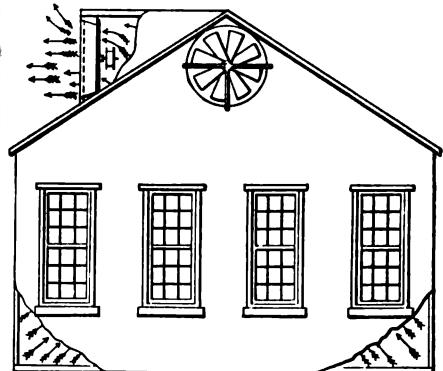


Fig. 6

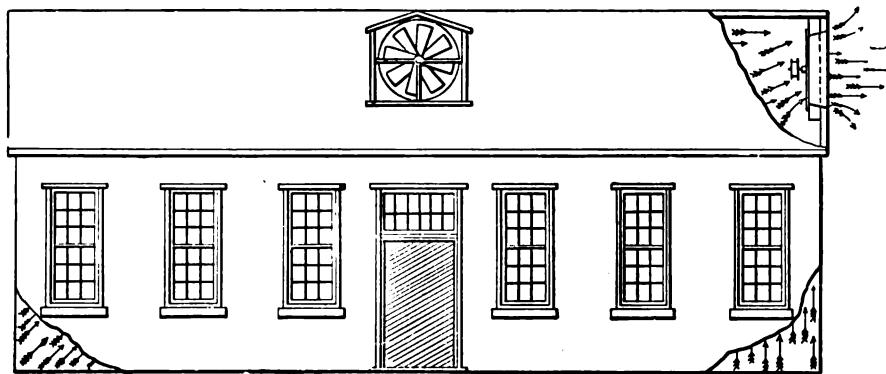


Fig. 7.

HERE are thousands of Buffalo Disk Wheels in use for removing smoke, steam, gas, bad odors, hot air, etc., from factories, engine and boiler rooms, foundries, blacksmith shops, etc., all giving the best satisfaction where our instructions as to application have been followed. A common form of application is shown in Figs. 6 and 7. The use of a disk wheel in places of this kind will insure perfect freedom from foul air, injurious gases, corrosive chemical fumes and all offensive odors which poison the air to an alarming degree and tell sooner or later on the health of those compelled to breathe it. It will be found a profitable investment, not only insuring an increased amount of work from employees, but greatly adding to their comfort and health.

In many foundries, at "pouring off" time the air is so full of steam, etc., as to nearly suspend operations. This annoyance may be obviated by proper applications. For removing smoke from ordinary blacksmith shops, with branch pipes and hoods running to each forge fire, these wheels are particularly adapted, and will always insure perfect freedom from smoke, no matter how heavy the air may be.

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Buffalo Disk Wheels,

Applied to Carpet Cleaning Rooms, Rattling Rooms in Foundries, Etc.

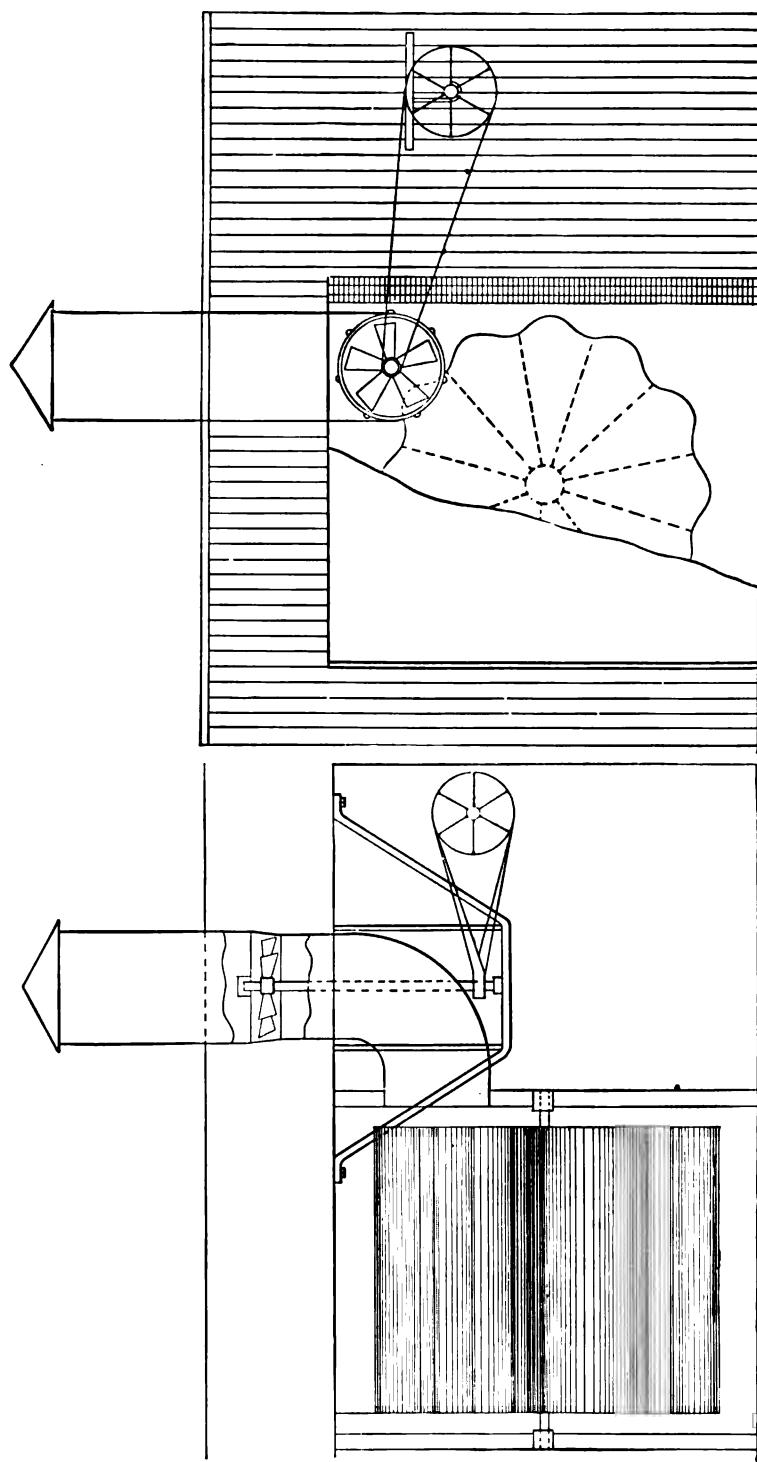


Fig. 8.

Fig. 9.

AN Elevation of carpet cleaning room, showing a Buffalo Disk Wheel applied for removing dust and driven by vertical shaft, appears in Fig. 8. For rattling rooms in foundries, etc., the above application of wheel is adapted.

Fig. 9 shows a Buffalo Disk Wheel as applied to a carpet beating room discharging dust and dirt upward through the pipe. This application is also often suited to rattling rooms in foundries, etc. Drawings will be furnished purchasers, where so desired and sufficient data is supplied to produce same, showing in detail special applications to their work.

Buffalo Disk Wheels,

Applied to Steam Laundries.

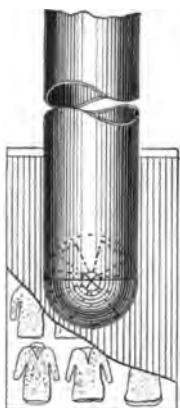


Fig. 10.

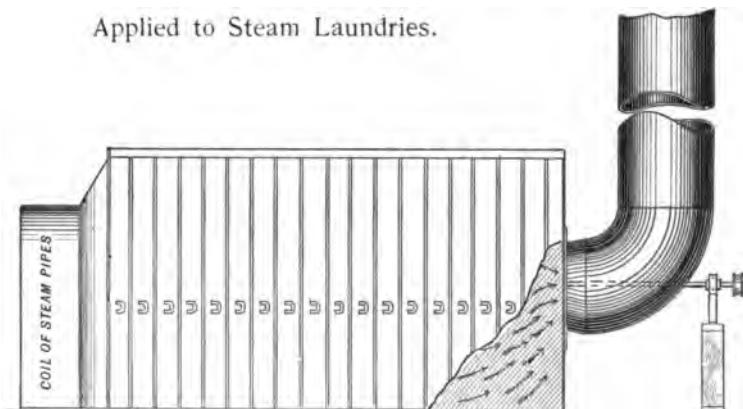


Fig. 11.

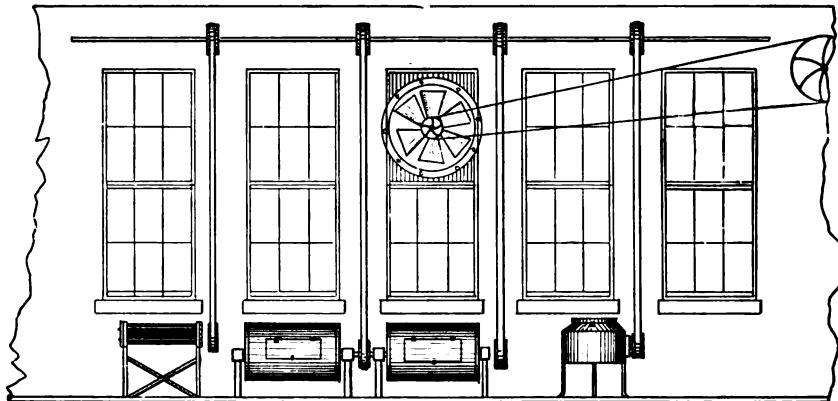


Fig. 12.

In THE above engravings we have a Buffalo Disk Fan applied for exhausting steam, hot air and all offensive odors common to laundry rooms, containing the washing, dampening, wringing and other machinery. By removing bad odors and supplying an ample amount of fresh air at all times, which may be done by the use of one of the fans at small initial outlay and little expense of power, employees will be found to execute a greater amount and better class of work than if left to inhale the many impurities incident to laundry work. The efficiency of a fan in laundries is perhaps more noticeable than in many other uses. It should be large enough to quickly carry out the steam. That the Buffalo Disk Wheel is unquestionably better adapted for the purpose than any other is shown by its being used in a large proportion of all the leading establishments.

Figs. 10 and 11 show a Buffalo Exhaust Wheel drawing a current of hot air from the coils of pipe located at opposite end of dryer. With hot dry air coming in direct contact with the clothes in dryer, the work is done evenly, thoroughly and in considerably less time than can be done by any other method.

Buffalo Disk Wheels,

Applied for Drying Soap and Glue.

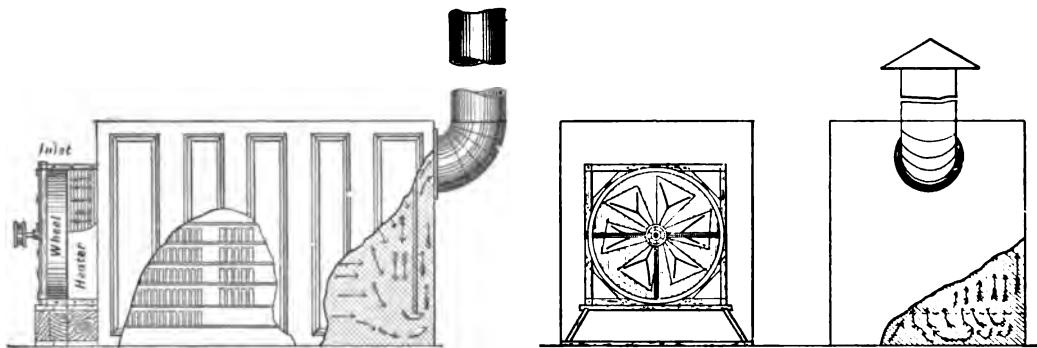


Fig. 13.

THE above cut, Fig. 13, clearly shows a sectional view of a Buffalo Disk Fan and heater coils at one end, applied to a soap drying room. The arrangement is such that the air is forced evenly over the surface of the soap, gradually reaching every part of the dryer, then discharging upward through the pipe. In warm weather these coils of pipe may be filled with brine, which has the effect of condensing the large amount of moisture in the air, thus greatly increasing its drying capacity before passing over the soap. When the air is naturally in its best condition for drying, the steam may be turned off altogether and the brine dispensed with also, if desired.

Another effective arrangement for this work is to place a Buffalo Disk Wheel at opposite end of the room, exhausting air from the coils instead of blowing through. The advantage of the Buffalo Disk Wheel for this purpose not only lies in its doing the work quicker, but saves much time and space, while in a properly constructed outfit the drying is done very evenly. We are always pleased to furnish, free of expense, plans of dryers to those entrusting their order for wheels to us.

Both of these arrangements are well adapted for drying glue, though for factories having large drying rooms the Buffalo Hot Blast Apparatus, described on previous pages, is much better adapted, giving positive results which are not to be obtained with a disk wheel except in small dryers.

Glue dries most rapidly at a temperature of 70 degrees, which may be maintained at all seasons, as above shown. Some attention to the thermometer, of course, will be in order.

The cost of reducing the temperature of the air to 70 degrees in summer by using brine in pipes is even less than that of raising the temperature to 70 degrees in winter, using steam in the heater. The work, therefore, may be carried on with profit the entire year.

In all applications of a Buffalo Disk Wheel with piping, locate as near to the work to be done as possible, and have main pipe to and from the wheel always its full diameter. With pipe of proper dimensions, a certain wheel will handle as much, and oftentimes more air than a larger size could with insufficient diameter of pipe. Bends or turns in piping or flues should invariably be made with very easy curves.

Buffalo Disk Wheels,

Application to Candy Manufactories.

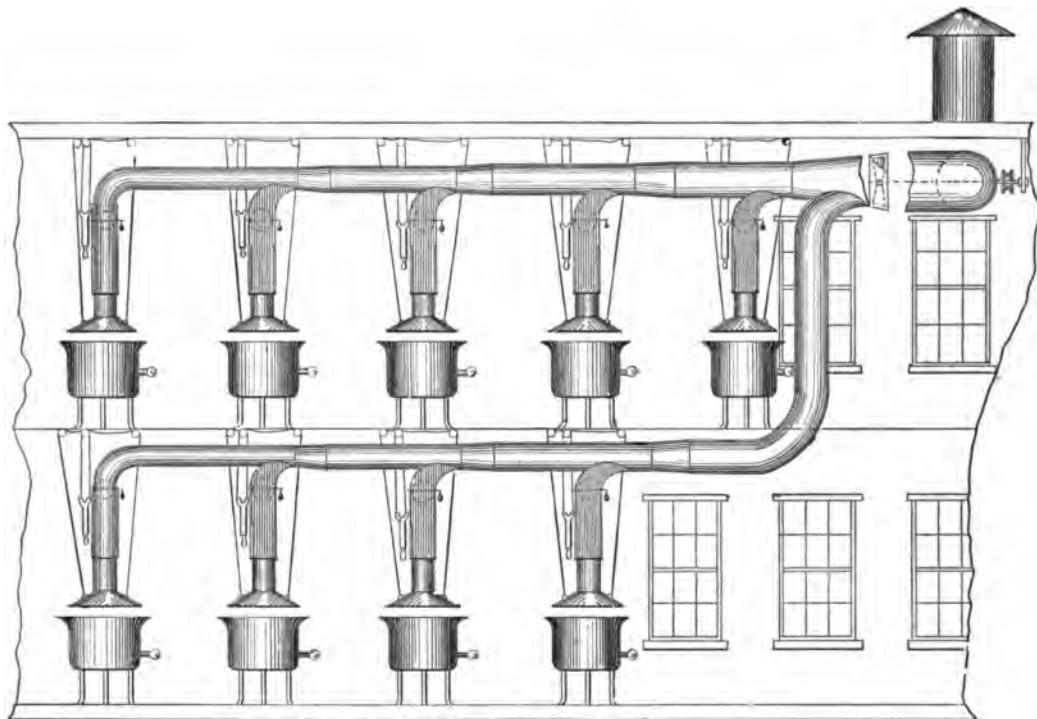


Fig. 14.

FIG. 14 shows a Buffalo Disk Wheel applied for removing steam from boiling kettles in candy factories with telescopic joints, hoods, counter-balancing weights and dampers in each branch pipe to the different kettles. For all cooling operations in candy manufactories, a Buffalo Ventilating Fan will be found to greatly facilitate the work. In removing starch from chocolate and other creams, these fans have been adapted with gratifying success. The same appliances shown above are adapted to forge fires in blacksmith shops, where not too numerous.

Our latest development in hoods, telescopic joints and the usual appurtenances for each kettle is not shown by the above cut. It consists of a patented device which, while permitting the easy raising or lowering of hoods, dispenses with much of the cable above shown. All is concealed inside of the joint.

Special drawings of application to each individual case will be furnished with every order when enough data is sent to enable their preparation. Scarcely a confectionery establishment in any large city should be without an arrangement of this nature, and Buffalo Fans will be found in nearly all which are now equipped.

Buffalo Disk Wheels,

Application for Removing Steam and Heat in Paper Mills.

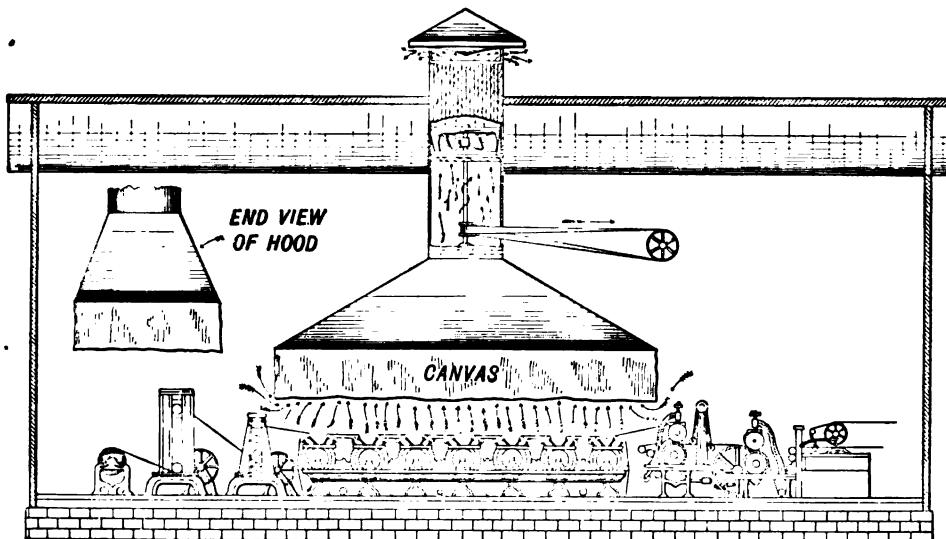


Fig. 15.

HOW to apply a Buffalo Disk Wheel to remove all steam arising from paper machines is clearly shown in Figure 11, as above. The hood proper may consist of sheet steel or of galvanized iron. It is desirable, however, especially if the hood be of some length and rather narrow, to have the overhanging part of thick, heavy, oiled canvas, this being more easily attached than long strips of galvanized iron. The corners may be laced together or not joined, as preferred; either arrangement will admit of the canvas being raised up out of the way when working over the machinery.

To secure the maximum efficiency of a wheel used in connection with a large hood, it is always necessary to bring it down close to the work to be performed.

The condensation of steam in winter in paper mills produces much annoyance and considerable actual loss, in many instances, from its dripping upon stock. Where these mills are heated with the Buffalo Hot Blast System, this feature will be scarcely noticeable, under the general conditions met.

The size of a wheel for a textile mill or the machine room of a paper mill, primarily depends upon the size of same, and how often it will be necessary to make a change of air to prevent dripping of the condensed steam. In some instances, only a slight current of air will accomplish the desired results, while in others, a large volume and a strong velocity are needed.

Buffalo Disk Wheels,

Application to Hotel Kitchens.

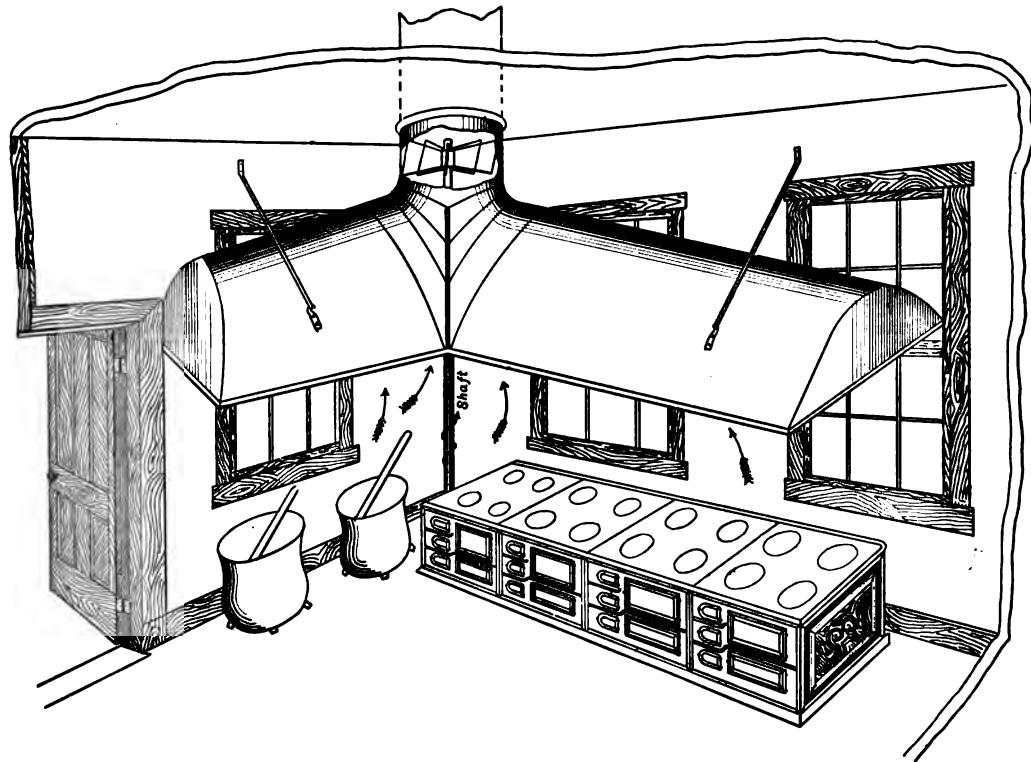


Fig 17.

HOW to successfully remove the disagreeable odors arising from cooking in hotel kitchens, which always pervade the other rooms to a greater or less degree, is shown in above Fig. 17. The small expense for an outfit thus arranged cannot be compared with the comforts derived by guests and employees.

Frequently the ranges, etc., are located at different points, when an application of a different nature becomes necessary. The numerous cuts appearing on accompanying pages will offer ample suggestions or drawings of special arrangements suited to existing conditions will be furnished with each order.

For cooling and carrying off offensive odors, Buffalo Disk Wheels, and also the Steel Plate Volume Fans, elsewhere described, have found wide favor in hotel kitchens and restaurants. The type which will most effectually perform for such service is governed by the conditions to be met in applying.

Buffalo Disk Wheels,

Application for Restaurant Ventilation.



Fig. 16.

A HOT restaurant, filled with the odors arising from cooking, and naturally a favorite retreat for swarms of flies in summer, is anything but attractive to customers. Such, however, is not shown in the above cut, Fig. 16. On the contrary, the Buffalo Disk Ventilating Wheel, placed near the ceiling, as shown, not only insures pure fresh air at all times, but entirely frees the room from cooking odors. Another comfort is also derived in that all flies are taken out; none ever remain in a room where the air is constantly being kept in motion or exhausted. The Buffalo Disk Wheel is so constructed that it does not obscure the light, and it is in reality an ornament to a room of this kind. Leading restaurants throughout the country use these fans with the application substantially as shown, with the most gratifying results.

Where several rooms or apartments are to be ventilated, the work may be easily accomplished by the introduction of several fans or by one large one through a system of piping. Electric fans, described on a previous page, are very desirable for this service and frequently the only means of introducing power.

For the ventilation of very large restaurants, to secure uniform results throughout, and especially when it is desirable to have a very appreciable current of air on hot days, an additional wheel is frequently employed to blow cool air into the room. Arrangements may then be made for running both at the same time, or either separately, as desired.

Loss of Heat from Exposed Steam Pipes,

With Relative Value of Coverings.

FOR the data and tables on this page this house acknowledges the courtesy of Messrs. Babcock & Wilcox Boiler Co., New York, it being derived largely from their well-known book "Steam." The loss by radiation from exposed steam pipes is considerable, and in the case of pipes leading to steam engines, it is magnified by the action of the condensed water in the cylinder. As the Buffalo Hot Blast Apparatus is frequently located at some distance from the boilers furnishing the outfit with steam, it is, therefore, important that pipes carrying either live or exhaust steam to the apparatus should be well protected. The following table gives the loss of heat from steam pipes, naked and clothed with wool or hair felt, of different thickness, the steam pressure being assumed at 75 lbs. and the extreme air at 60°. There is a wide difference in the value of different substances for protection from radiation, their value varying nearly in the inverse ratio of their conducting power for heat, up to their ability to transmit as much heat as the surface of the pipe will radiate, after which they become detrimental, rather than useful, as covering.

Hair or wool felt has the disadvantage of becoming soon charred from the heat of steam at high pressure, and sometimes of taking fire therefrom. This has led to the employment of a variety of "cements" for covering pipes—composed generally of clay mixed with different substances, as asbestos, paper fibre, charcoal, etc. A series of careful experiments, made at the Massachusetts Institute of Technology in 1871, showed the condensation of steam in a pipe covered by one of them, as compared with a naked pipe, and one clothed with hair felt, was 100 for the naked pipe, 67 for the "cement" covering, and 27 for the hair felt.

TABLE OF LOSS OF HEAT FROM STEAM PIPES.

Thickness of Covering in Inches	OUTSIDE DIAMETER OF PIPE, WITHOUT FELT											
	2-IN. DIAMETER			4-IN. DIAMETER			6-IN. DIAMETER			8-IN. DIAMETER		
	Loss in Units per Foot Run per Hour	Ratio of Loss	Feet in Length per H. P. lost	Loss in Units per Foot Run per Hour	Ratio of Loss	Feet in Length per H. P. lost	Loss in Units per Foot Run per Hour	Ratio of Loss	Feet in Length per H. P. lost	Loss in Units per Foot Run per Hour	Ratio of Loss	Feet in Length per H. P. lost
0	219.0	1.00	132	390.8	1.00	75	624.1	1.000	46	729.8	1.000	40
	100.7	.46	288	180.9	.46	160				1077.4	1.000	26
	65.7	.30	441	117.2	.30	247	187.2	.300	154	219.6	.301	132
1	43.8	.20	662	73.9	.18	392	111.0	.178	261	128.3	.176	225
2	28.4	.13	1020	44.7	.11	648	66.2	.106	438	75.2	.103	385
4	19.8	.09	1464	28.1	.07	1031	41.2	.066	703	46.0	.063	630
6				23.4	.06	1238	33.7	.054	860	34.3	.047	845

TABLE OF RELATIVE VALUE OF NON-CONDUCTORS

(FROM CHAS. E. EMERY, PH. D.)

Non-Conductor	Value	Non-Conductor	Value	Substance	Conduct'g Power	Substance	Conduct'g Power
Wood felt .	1.000	Loam, dry and open	.550	Blotting paper . . .	.274	Wood, across fibre . . .	.83
Mineral wool No. 2	.832	Slacked lime . . .	.480	Eiderdown . . .	.314	Cork	1.15
" with tar .	.715	Gas house carbon . . .	.470	Cotton or wool . . .	.323	Coke, pulverized . . .	1.29
Sawdust . . . . .	.680	Asbestos . . . . .	.363	any density . . .		India rubber	1.37
Mineral wood No. 1	.676	Coal ashes . . . . .	.345	Hemp, canvas . . .	.418	Wood, with fibre . . .	1.40
Charcoal . . . . .	.632	Coke in lumps . . .	.277	Mahogany dust . . .	.523	Plaster of Paris . . .	3.86
Pine wood, across fibre . . . . .	.553	Air space undivided	.136	Wood ashes . . .	.531	Baked clay	4.83
				Straw . . . . .	.563	Glass	6.6
				Charcoal powder . . .	.636	Stone	13.68

TABLE OF CONDUCTING POWER OF VARIOUS SUBSTANCES.

(FROM PECKET.)

Diameter of Blast Pipes.

IT WILL be seen, by reference to the following table, that the diameter of pipe for transmitting or carrying air from one point to another, changes with the length or distance which the air is carried from the blower to the furnace, or other point of delivery.

As air moves through pipes, a portion of its force is retarded by the friction of its particles along the sides of the pipe, and the loss of pressure from this source increases directly as the length of the pipe, and as the square of the velocity of the moving air.

This fact has long been known, and many experimenters and engineers, by close observation and long continued experiments, have established formulas by which the loss of pressure and the additional amount of power required to force air or gases through pipes of any length and diameter may be computed.

As these formulas are commonly expressed in algebraic notation, not in general use, we have thought it desirable to arrange a table showing at a glance all the necessary proportionate increase in diameter and length of blast pipes and conical mouth-pieces, in keeping up the pressure to the point of delivery. It is often the case, where a blower is condemned as being inefficient, the cause of its failure is, that the pipe connections are too small for their lengths, coupled with a large number of short bends, without regard to making the pipe tight, which is a necessity.

The table, diameter of pipes, given below, showing the necessary increase in the size of pipes in proportion to the lengths, is what we call a practical one, and experience has proved the necessity for it.

**TABLE SHOWING THE NECESSARY INCREASE IN DIAMETER FOR
THE DIFFERENT LENGTHS.**

LENGTH OF PIPE	30 FT.	60 FT.	90 FT.	120 FT.	150 FT.	180 FT.	210 FT.	240 FT.	270 FT.	300 FT.
Diameter of Blower Outlet in Inches	Diameter of Pipe should be									
3	3	3	4	4	4	5	5	5	5	5
3½	3½	4	4½	4½	5	5½	5½	5½	5½	5½
4	4	4	5	5	5	6	6	6	6	7
4½	4½	5	5½	5½	6	6½	7	7	7	7½
5	5	6	6½	6½	7	7½	8	8½	9	10
6	6	7	7½	8	8½	9	9½	10	11	12
7	7	8	8½	9	10	10½	11	11½	12	13
8	8	9	10	10½	11½	12	12½	13	14	15
9	10	10½	11	12	13	14	14½	15	16	17
10	11	11½	12	13	14	15	16	16½	17	18
11	12	13	13½	14½	15½	17	17½	18	19	20
12	13	14	15	16	17	18	19	20	21	22
13	14	15	16½	17½	18½	19½	20	21	22	23
14	15	16	17½	18	19½	20½	21½	22	23	24
15	16	17	19	20	21	22	23	24	25	26
16	17	19	20½	21½	22½	23½	24½	25	26	27
17	17	20	21	22	24	25	26	27	28	29
18	19	21	22½	24	25½	26½	27½	29	30	31
19	20	22	24	25	27	28	29½	30	31	33
20	22	23	25	27	28½	29½	31	32	33	34
21	23	24	26	28	29½	31	32	33	35	36
22	24	26	27	29	31½	32½	34	35	36	38
23	25	27	29	30	32½	34	35½	37	38	39
24	26	28	30½	32½	34	35½	37	38	40	41½
Length of Pipe.	30 ft.	60 ft.	90 ft.	120 ft.	150 ft.	180 ft.	210 ft.	240 ft.	270 ft.	300 ft.
Length of Mouth-piece.	9 in.	15 in.	21 in.	27 in.	33 in.	39 in.	42 in.	48 in.	54 in.	60 in.

Diameter of Air Pipes for Various Velocities.

BELOW we append table giving the different diameters of pipes required to deliver from 100 to 50,000 cubic feet of air per minute at various pressures per square inch and velocities in feet per second, no allowance being made for loss by friction in long pipes. Reference to table of "Diameters of Blast Pipes," will show the necessary increase in diameters for different lengths, etc.

The data embodied in the accompanying tables and on other pages herewith, is presented as being the only authentic and reliable information yet published. The practical value of these formulas, which have been originated from actual tests of plants now in operation, is not to be compared with the unreliable theoretical calculations published by others.

CUBIC FEET AIR PER MINUTE	$\frac{1}{2}$ Oz. Pressure	$\frac{1}{4}$ Oz. Pressure	$\frac{1}{8}$ Oz. Pressure	$\frac{1}{16}$ Oz. Pressure	$\frac{1}{32}$ Oz. Pressure	$\frac{1}{64}$ Oz. Pressure	$\frac{1}{128}$ Oz. Pressure
	Velocity 11 Feet per Second	Velocity 15.5 Feet per Second	Velocity 22 Feet per Second	Velocity 33 Feet per Second	Velocity 60.9 Feet per Second	Velocity 74.7 Feet per Second	Velocity 86.25 Feet per Second
DIAMETERS OF PIPE, IN INCHES							
100	5.3	4.5	3.8	2.7	2.3	2	1.9
200	7.5	6.4	5.3	3.8	3.2	2.9	2.7
300	9.2	7.7	6.5	4.7	3.9	3.6	3.3
400	10.6	9	7.5	5.4	4.5	4.1	3.8
500	11.8	10.1	8.4	6	5.1	4.6	4.3
600	12.9	11.1	9.2	6.6	5.5	5	4.7
700	14	11.9	9.9	7.1	6	5.4	5
800	15	13	10.6	7.6	6.4	5.8	5.4
900	15.9	13.4	11.3	8	6.8	6.1	5.7
1000	16.7	14.1	11.8	8.5	7.1	6.4	6
1250	18.8	15.8	13.2	9.5	8	7.2	6.7
1500	20.5	17.2	14.5	10.4	8.7	7.9	7.4
1750	22.3	18.6	15.6	11.2	9.4	8.5	7.9
2000	23.6	20	16.7	12	10.1	9.1	8.6
2500	26.6	22.3	18.7	13.4	11.3	10.5	9.4
3000	28.9	24.4	20.5	14.7	12.4	11.1	10.3
3500	32	26.6	22.3	15.8	13.3	12.1	11.6
4000	33.4	28	23.6	16.9	13.8	12.8	11.9
4500	35.4	29.7	25.1	17.9	15.1	13.6	12.7
5000	37.3	31.4	26.4	18.9	15.8	14.3	13.4
6000	40.9	34.4	28.9	20.7	17.4	15.7	14.6
7000	44.1	37.1	31.2	22.3	18.8	17	15.8
8000	47.2	39.7	33.4	23.9	20.1	18.1	16.9
9000	50	42.2	35.4	25.3	21.3	19.2	17.9
10000	52.7	44.4	37.3	26.7	22.4	20.3	18.9
15000	64.6	54.3	45.7	32.7	27.4	24.8	23.1
20000	74.6	62.5	52.7	37.7	31.7	28.6	26.6
25000	84	70.2	59	42.2	35.5	32	29.8
30000	91.3	76.9	64.6	46.2	38.8	35.1	32.6
35000	98.6	83	69.8	49.8	41.8	37.9	35.2
40000	105.5	88.2	74.6	53.3	43.6	40.5	37.7
50000	118	99.3	83.4	59.6	50.1	45.3	42.1

Table of the Areas of Circles and of Sides of Squares of Same Area.

Diameter of Circle in Inches	Area of Circle in Square Inches	Side of Square of same Area in Square Inches	Diameter of Circle in Inches.	Area of Circle in Square Inches	Side of Square of same Area in Square Inches	Diameter of Circle in Inches	Area of Circle in Square Inches	Side of Square of same Area in Square Inches
1	.7854	.8862	26	530.93	23.0419	51	2042	45.1976
2	3.1416	1.7724	27	572.56	23.9281	52	2123	46.0838
3	7.0686	2.6587	28	615.75	24.8144	53	2206	46.97
4	12.5664	3.4549	29	660.52	25.7006	54	2290	47.8562
5	19.635	4.4311	30	706.86	26.5868	55	2376	48.7425
6	28.2744	5.3174	31	754.77	27.473	56	2463	49.6287
7	38.4846	6.2036	32	804.25	28.3594	57	2552	50.5149
8	50.2656	7.0898	33	855.30	29.2455	58	2642	51.4012
9	63.6174	7.976	34	907.9	30.1317	59	2734	52.2874
10	78.54	8.8623	35	962.12	31.0179	60	2827	53.1736
11	95.03	9.7485	36	1017.9	31.9042	61	2922	54.0598
12	113.10	10.6347	37	1075.2	32.7904	62	3019	54.9061
13	132.73	11.5209	38	1134.1	33.6766	63	3117	55.8323
14	153.94	12.4072	39	1194.6	34.5628	64	3217	56.7185
15	176.72	13.2934	40	1256.6	35.4491	65	3318	57.6047
16	201.06	14.1796	41	1320.3	36.3353	66	3421	58.491
17	226.98	15.0659	42	1385.4	37.2215	67	3526	59.3772
18	254.47	15.9521	43	1452.2	38.1078	68	3632	60.2634
19	283.53	16.8383	44	1520.5	38.9444	69	3739	61.1497
20	314.16	17.7245	45	1590.4	39.8802	70	3848	62.0359
21	346.36	18.6108	46	1661.9	40.7664	71	3959	62.9221
22	380.13	19.497	47	1734.9	41.6527	72	4072	63.8083
23	415.47	20.3832	48	1809.5	42.5389	73	4185	64.6946
24	452.39	21.2694	49	1885.7	43.4251	74	4301	65.5808
25	490.88	22.1557	50	1963.5	44.3113	75	4418	66.467

Table for Equalizing the Diameters of Pipes.

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Diameter of Main Pipe in inches	Blast Pipe in inches	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	8010	8011	8012	8013	8014	8015	8016	8017	8018	8019	8020	8021	8022	8023	8024	8025	8026	8027	8028	8029	8030	8031	8032	8033	8034	8035	8036	8037	8038	8039	8040	8041	8042	8043	8044	8045	8046	8047	8048	8049	8050	8051	8052	8053	8054	8055	8056	8057	8058	8059	8060	8061	8062	8063	8064	8065	8066	8067	8068	8069	8070	8071	8072	8073	8074	8075	8076	8077	8078	8079	8080	8081	8082	8083	8084	8085	8086	8087	8088	8089	8090	8091	8092	8093	8094	8095	8096	8097	8098	8099	80100	80101	80102	80103	80104	80105	80106	80107	80108	80109	80110	80111	80112	80113	80114	80115	80116	80117	80118	80119	80120	80121	80122	80123	80124	80125	80126	80127	80128	80129	80130	80131	80132	80133	80134	80135	80136	80137	80138	80139	80140	80141	80142	80143	80144	80145	80146	80147	80148	80149	80150	80151	80152	80153	80154	80155	80156	80157	80158	80159	80160	80161	80162	80163	80164	80165	80166	80167	80168	80169	80170	80171	80172	80173	80174	80175	80176	80177	80178	80179	80180	80181	80182	80183	80184	80185	80186	80187	80188	80189	80190	80191	80192	80193	80194	80195	80196	80197	80198	80199	80200	80201	80202	80203	80204	80205	80206	80207	80208	80209	80210	80211	80212	80213	80214	80215	80216	80217	80218	80219	80220	80221	80222	80223	80224	80225	80226	80227	80228	80229	80230	80231	80232	80233	80234	80235	80236	80237	80238	80239	80240	80241	80242	80243	80244	80245	80246	80247	80248	80249	80250	80251	80252	80253	80254	80255	80256	80257	80258	80259	80260	80261	80262	80263	80264	80265	80266	80267	80268	80269	80270	80271	80272	80273	80274	80275	80276	80277	80278	80279	80280	80281	80282	80283	80284	80285	80286	80287	80288	80289	80290	80291	80292	80293	80294	80295	80296	80297	80298	80299	80300	80301	80302	80303	80304	80305	80306	80307	80308	80309	80310	80311	80312	80313	80314	80315	80316	80317	80318	80319	80320	80321	80322	80323	80324	80325	80326	80327	80328	80329	80330	80331	80332	80333	80334	80335	80336	80337	80338	80339	80340	80341	80342	80343	80344	80345	80346	80347	80348	80349	80350	80351	80352	80353	80354	80355	80356	80357	80358	80359	80360	80361	80362	80363	80364	80365	80366	80367	80368	80369	80370	80371	80372	80373	80374	80375	80376	80377	80378	80379	80380	80381	80382	80383	80384	80385	80386	80387	80388	80389	80390	80391	80392	80393	80394	80395	80396	80397	80398	80399	80400	80401	80402	80403	80404	80405	80406	80407	80408	80409	80410	80411	80412	80413	80414	80415	80416	80417	80418	80419	80420	80421	80422	80423	80424	80425	80426	80427	80428	80429	80430	80431	80432	80433	80434	80435	80436	80437	80438	80439	80440	80441	80442	80443	80444	80445	80446	80447	80448	80449	80450	80451	80452	80453	80454	80455	80456	80457	80458	80459	80460	80461	80462	80463	80464	80465	80466	80467	80468	80469	80470	80471	80472	80473	80474	80475	80476	80477	80478	80479	80480	80481	80482	80483	80484	80485	80486	80487	80488	80489	80490	80491	80492	80493	80494	80495	80496	80497	80498	80499	80500	80501	80502	80503	80504	80505	80506	80507	80508	80509	80510	80511	80512	80513	80514	80515	80516	80517	80518	80519	80520	80521	80522	80523	80524	80525	80526	80527	80528	80529	80530	80531	80532	80533	80534	80535	80536	80537	80538	80539	80540	80541	80542	80543	80544	80545	80546	80547	80548	80549	80550	80551	80552	80553	80554	80555	80556	80557	80558	80559	80560	80561	80562	80563	80564	80565	80566	80567	80568	80569	80570	80571	80572	80573	80574	80575	80576	80577	80578	80579	80580	80581	80582	80583	80584	80585	80586	80587	80588	80589	80590	80591	80592	80593	80594	80595	80596	80597	80598	8059

Table Exhibiting Horse-power and Pressure Required To Overcome Friction of Air Passing Through Pipes.

BY COMPARISON it will be observed that, should it be desirable to convey 100 feet of air through a pipe 3 inches in diameter, it must have a velocity of 2000 feet per minute, thus losing 1.5 ozs. of pressure in friction, whereas if the same volume of air is transmitted through a pipe 9 inches in diameter, it requires a velocity of only 227 feet per minute, accompanied by a loss of friction of .05 ozs. The horse-power expended in the former and latter is as .097 to .005, or 19 to 1 in favor of the latter. The advantage in choosing a larger diameter pipe is clearly apparent. Pipes of different lengths than those enumerated are subject to the same relations. It will also be observed that, in forcing air through a 3-inch diameter pipe under a velocity of 2000 feet per minute, the resistance or back pressure is equal to 1.5 ozs. This table has been calculated for a pipe 100 feet long; but, multiplying the numbers in the table by the ratio of the increase in length of pipes, for example, a pipe 150 feet long \times 1.5; 300 feet long \times 3; 400 feet long \times 4, etc. The differences of temperature between the ends of the pipes, if any, should be taken into consideration, but no allowance of this nature has been provided for in the table. All losses given in table should be provided for by increased speed on the blower, likewise requiring additional power.

DIAMETER OF PIPES IN INCHES.

VELOCITY OF AIR IN FEET PER MINUTE	3-INCH			4-INCH			5-INCH			6-INCH			7-INCH			8-INCH			9-INCH		
	Loss of Pressure in Oz. per Square Inch	H. P. Lost in Friction	Loss of Pressure in Oz. per Square Inch	H. P. Lost in Friction	Loss of Pressure in Oz. per Square Inch	H. P. Lost in Friction	Loss of Pressure in Oz. per Square Inch	H. P. Lost in Friction	Loss of Pressure in Oz. per Square Inch	H. P. Lost in Friction	Loss of Pressure in Oz. per Square Inch	H. P. Lost in Friction	Loss of Pressure in Oz. per Square Inch	H. P. Lost in Friction	Loss of Pressure in Oz. per Square Inch	H. P. Lost in Friction	Loss of Pressure in Oz. per Square Inch	H. P. Lost in Friction			
200	.015	.0000	.011	.0001	.000	.0002	.020	.0002	.000	.0001	.0007	.0001	.0003	.014	.0001	.0005	.0001	.0001	.0001		
300	.033	.0001	.025	.0004	.000	.0005	.036	.0005	.000	.0002	.0017	.0006	.0006	.025	.0007	.0022	.0008	.013	.0004		
400	.059	.0003	.044	.0004	.000	.0008	.056	.0010	.000	.0002	.0012	.0012	.0010	.040	.0014	.035	.0017	.019	.0009		
500	.093	.0006	.089	.0008	.000	.0010	.100	.0014	.000	.0001	.0018	.0018	.0014	.067	.0021	.057	.0025	.031	.0019		
600	.133	.0011	.100	.0014	.000	.0020	.120	.0019	.000	.0002	.0028	.0028	.0019	.109	.0034	.078	.0040	.050	.0022		
700	.181	.0017	.138	.0023	.000	.0034	.142	.0042	.000	.0002	.0042	.0042	.0034	.119	.0051	.102	.0059	.089	.0045		
800	.237	.0025	.178	.0034	.000	.0054	.180	.0050	.000	.0003	.0052	.0052	.0048	.150	.0072	.129	.0084	.112	.0065		
900	.300	.0036	.225	.0048	.000	.0070	.225	.0060	.000	.0004	.0072	.0072	.0060	.180	.0090	.159	.0116	.139	.0108		
1000	.370	.0049	.278	.0066	.000	.0083	.278	.0083	.000	.0005	.0083	.0083	.0070	.222	.0099	.185	.0132	.123	.0148		
1500	.823	.0167	.625	.0223	.000	.0279	.625	.0223	.000	.0005	.0335	.0335	.0279	.417	.0335	.357	.0390	.312	.0446		
2000	1.481	.0397	1.111	.0529	.000	.0889	1.735	.1032	.000	.0006	.741	.741	.689	.102	.0793	.635	.0925	.556	.1058		
2500	2.314	.0774	1.0774	1.1244	.000	.1389	1.389	1.1557	.000	.0008	1.548	1.548	1.389	.124	.1805	.1805	.18678	.2065	.278		
3000	3.333	1.339	2.500	.1785	.000	.2231	1.785	2.000	.000	.0008	1.667	1.667	1.429	.2077	.1.429	.3123	.1.250	.3569	.4016		
3500	4.5396	2.058	3.404	.2838	.000	.3545	2.723	2.203	.000	.0013	1.945	1.945	1.7047	.4667	.0793	.635	.0925	.556	.1058		
4000	5.926	3.173	4.444	.4230	.000	.5556	3.556	3.288	.000	.0016	2.963	2.963	2.540	.5192	.7403	.7403	.2.2922	.8461	.1.975		
4500	7.5	4.518	5.625	.6020	.000	4.5	.7531	.7531	.000	.0019	3.7833	3.7833	3.2143	.9119	.1.055	.1.055	.2.8125	.1.2051	.2.5		
5000	9.2591	6.086	6.944	.8495	.000	.5556	1.0323	4.662	.000	.0021	1.231	1.231	1.4572	.5192	.1.7047	.3.422	.6364	.1.6291	.4016		
5500	11.905	8.765	8.403	1.0999	.000	6.722	1.3749	5.601	.000	.0023	4.816	4.816	1.9307	.4.203	.2.0871	.4.203	.1.975	.4.2751	.1.8593		
6000	13.333	1.0710	10.000	1.4278	.000	8.000	1.7847	6.667	.000	.0026	2.1416	2.1416	5.714	.2.4986	.5.000	.2.4986	.5.000	.2.8855	.4.444		

**Table Exhibiting Horse-power and Pressure Required
To Overcome Friction of Air Passing Through Pipes.**
(CONTINUED.)

DIAMETER OF PIPE IN INCHES											
VELOCITY OF AIR IN FEET PER MINUTE	10-INCH			12-INCH			14-INCH			16-INCH	
	Loss of Pressure in Oz. per Square Inch	H. P. Lost in Friction	Loss of Pressure in Oz. per Square Inch	H. P. Lost in Friction	Loss of Pressure in Oz. per Square Inch	H. P. Lost in Friction	Loss of Pressure in Oz. per Square Inch	H. P. Lost in Friction	Loss of Pressure in Oz. per Square Inch	H. P. Lost in Friction	
200	.004	.0001	.004	.0002	.003	.0002	.003	.0002	.002	.0002	
300	.010	.0004	.008	.0005	.007	.0006	.006	.0007	.005	.0009	
400	.018	.0011	.015	.0013	.013	.0015	.011	.0017	.010	.0019	
500	.028	.0021	.023	.0025	.020	.0029	.017	.0033	.016	.0037	
600	.040	.0036	.033	.0043	.029	.0050	.025	.0057	.022	.0064	
700	.054	.0057	.046	.0068	.039	.0079	.034	.0091	.030	.0102	
800	.071	.0085	.059	.0102	.051	.0118	.044	.0135	.040	.0152	
900	.090	.0120	.075	.0145	.064	.0169	.056	.0193	.050	.0217	
1000	.111	.0165	.092	.0198	.079	.0231	.069	.0264	.062	.0297	
1500	.25	.0558	.203	.0639	.18	.0787	.16	.0914	.14	.1012	
2000	.444	.1322	.370	.1586	.317	.1851	.278	.2115	.247	.2380	
2500	.6945	.2582	.5788	.3152	.496	.3615	.434	.413	.3859	.4649	
3000	1.000	.4462	.833	.5354	.714	.6245	.625	.7140	.556	.8031	
3500	1.361	.7085	1.134	.8501	.972	.9918	.8506	1.1338	.7561	1.2753	
4000	1.778	1.0576	1.481	1.2691	1.270	1.4807	1.111	1.6922	.988	1.9037	
4500	2.15	1.439	1.875	1.807	1.607	2.1083	1.406	2.4093	1.25	2.7109	
5000	2.798	2.0809	2.315	2.4793	1.984	2.8921	1.736	3.3052	1.543	3.7067	
5500	3.361	2.7495	2.801	3.2066	2.40	3.8482	2.10	4.3979	1.867	4.9485	
6000	4.000	3.5694	3.333	4.2833	2.857	4.0959	2.500	5.7110	2.222	6.4249	

Table Exhibiting Horse-power and Pressure Required
To Overcome Friction of Air Passing Through Pipes.

(CONTINUED.)

DIAMETER OF PIPES IN INCHES

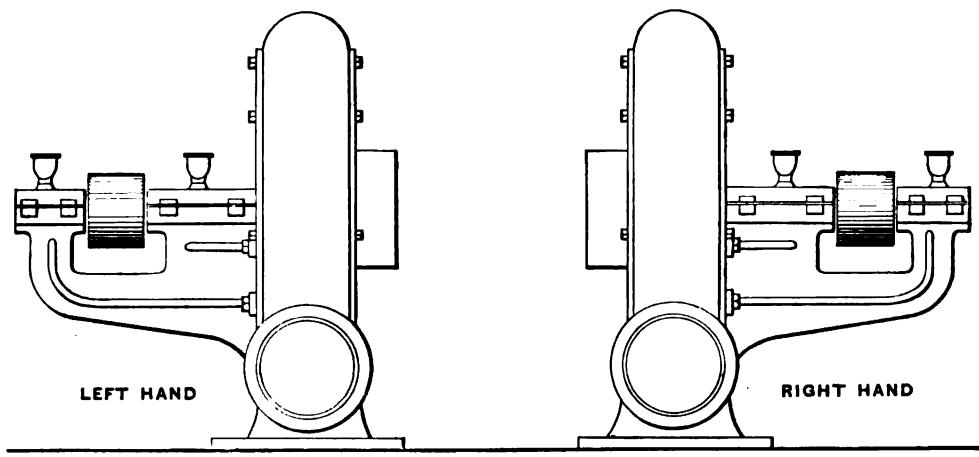
VELOCITY OF AIR IN FEET PER MINUTE	24-INCH		26-INCH		28-INCH		30-INCH		34-INCH		38-INCH		42-INCH	
	Loss of Pressure in Oz. per Square Inch	H. P. Lost in Friction	Loss of Pressure in Oz. per Square Inch	H. P. Lost in Friction	Loss of Pressure in Oz. per Square Inch	H. P. Lost in Friction	Loss of Pressure in Oz. per Square Inch	H. P. Lost in Friction	Loss of Pressure in Oz. per Square Inch	H. P. Lost in Friction	Loss of Pressure in Oz. per Square Inch	H. P. Lost in Friction	Loss of Pressure in Oz. per Square Inch	H. P. Lost in Friction
200	.00185	.0003167	.00171	.0003436	.00158	.0003454	.00148	.0003359	.00130	.000447	.00118	.0005064	.00106	.0005596
300	.0041	.001054	.00385	.00117	.00357	.00125	.00333	.001337	.00294	.001517	.00263	.001695	.00238	.001872
400	.00739	.00253	.00682	.00274	.00634	.002955	.00591	.003162	.00522	.003587	.00467	.004008	.00422	.004425
500	.01156	.00495	.01068	.005367	.00991	.005776	.00925	.006189	.00816	.00702	.00730	.007837	.00861	.008669
600	.01667	.00857	.01538	.00928	.01428	.00992	.01333	.010707	.01176	.012133	.01053	.01357	.00952	.014874
700	.02266	.01558	.02692	.01472	.01942	.01584	.01813	.01698	.01599	.019234	.01431	.02115	.01245	.02377
800	.02961	.0205	.02734	.02199	.02538	.02367	.02361	.02537	.02090	.02874	.01870	.03213	.01842	.035508
900	.0375	.0289	.03462	.03133	.03213	.03372	.03	.036146	.02847	.041007	.02368	.04578	.02143	.050608
1000	.04626	.0377	.04270	.04292	.03965	.04622	.03701	.04953	.03265	.05633	.02922	.062738	.02643	.06932
1500	.10417	.13387	.09615	.14502	.08929	.15619	.08333	.1673	.07353	.18908	.06579	.21197	.05452	.23427
2000	.18515	.31724	.17091	.34368	.15727	.35906	.14678	.38296	.12952	.4446	.11588	.49776	.10485	.550187
2500	.28926	.58663	.26701	.6712	.24793	.72272	.23141	.7758	.20418	.8767	.18269	.9809	.16529	.10841
3000	.41667	1.07101	.38461	1.1602	.35714	1.2494	.33333	1.33874	.29412	1.51747	.26316	1.69576	.23901	1.87357
3500	.56706	1.68037	.52344	1.8409	.48606	1.98384	.45365	2.1252	.40028	.2.4079	.35815	2.6924	.32404	2.9746
4000	.74059	2.53789	.68362	2.7494	.63479	2.9809	.59247	3.17236	.52277	.3.5936	.46773	4.01324	.42319	4.47276
4500	.9375	3.6146	.86538	3.9158	.80357	4.217	.75	4.5183	.66176	.5.1255	.59211	5.7232	.53571	6.09827
5000	1.1573	4.9567	1.06828	5.3685	.90198	5.784	.92185	6.17055	.81693	7.0583	.70988	7.6236	.66132	8.6533
5500	1.4003	6.5983	1.2924	7.147	1.20023	7.6978	1.12021	8.2476	.988412	9.1228	.88332	10.4343	.80015	11.5467
6000	1.8867	8.568	1.5346	9.2587	1.42857	9.9859	1.3333	10.7097	1.17647	12.1157	1.05263	13.5398	.95	14.9565

Table Exhibiting Horse-power and Pressure Required
To Overcome Friction of Air Passing Through Pipes.
(CONTINUED.)

VELOCITY OF AIR IN FEET PER MINUTE	DIAMETER OF PIPES IN INCHES					
	46-INCH		50-INCH		54-INCH	
	Loss of Pressure in Oz. per Square Inch	H. P. Lost in Friction	Loss of Pressure in Oz. per Square Inch	H. P. Lost in Friction	Loss of Pressure in Oz. per Square Inch	H. P. Lost in Friction
200	.00096	.000637	.000633	.00047	.00082	.000712
300	.00217	.00205	.002	.00223	.00185	.00241
400	.00385	.00484	.0035	.0052	.00328	.00569
500	.006032	.00949	.0055	.01022	.0051	.01105
600	.0086	.01624	.008	.01785	.0074	.0183
700	.0118	.0237	.0108	.02809	.0107	.0306
800	.0154	.0387	.0142	.04223	.01316	.0456
900	.0196	.0552	.018	.06024	.0166	.06507
1000	.0243	.0765	.0222	.0825	.0205	.0889
1500	.05435	.2568	.0499	.2783	.0462	.3006
2000	.0945	.6074	.08887	.6609	.08228	.71371
2500	.1509	1.187	.1388	.1289	.1285	.13932
3000	.2173	2.0518	.2	.2.2312	.1.851	.2.409
3500	.2958	3.266	.2721	.3.5425	.2.5202	.3.8257
4000	.3863	4.8631	.3551	.5.2816	.3.291	.5.7092
4500	.4891	6.928	.45	.6.678	.416	.8.1198
5000	.60338	9.495	.5555	.10.3305	.5143	.11.154
5500	.7305	12.65	.6721	.13.8159	.6223	.14.845
6000	.8695	16.421	.8	.17.8545	.7407	.19.1633

Buffalo Blowers and Exhausters,

Suggestions to Purchasers.



BUYERS of Buffalo Blowers and Exhausters will avoid a great many delays, together with attendant trouble and expense, by carefully observing the following points in ordering or making inquiries:

RIGHT AND LEFT HAND MACHINES.—The cuts, Figs. 1 and 2, while made from the "B" Volume type of Exhaust Fan, clearly illustrate the difference between a right and left hand fan in all the other types catalogued. Fig. 1 shows a bottom horizontal discharge left hand exhaust fan; Fig. 2, a right hand bottom horizontal discharge exhauster. All types of Steel Plate Steam and Pulley Fans, Planing Mill Exhausters, "B" Volume Blowers and "B" Exhaust Fans are built either right or left hand. Buffalo Steel Pressure Blowers, from No. 1 to No. 6, inclusive, have but one pulley, this regularly being on the right side of the machine, though a left hand blower may be as readily furnished.

STEEL PLATE EXHAUST FANS.—Invariably state for what service they are to be used, and the kind of work they are to perform. If for handling shavings or dust from wood-working machines, furnish a complete detailed list with description of each, preferred position of exhauster, distance material is to be carried, etc.; embody all the data in a diagram to scale also showing position of line shaft and direction it runs. If used for handling dust from emery grinders, the above remarks will also apply, and the dimensions of the emery wheel should be given. For exhausting smoke from forge fires, state the number of fires, whether of brick or iron construction, the preferred position of exhauster, position for the discharge of smoke, fumes, etc.; a sketch of the blacksmith shop covering these points will be of great help.

STEEL PRESSURE BLOWERS.—Be sure and give a clear description of the work they are to perform. When used for blowing cupola furnaces, state the diameter of the inside of the cupola lining, number and size of tuyeres, quantity of iron to be melted in a given time, kind of fuel used, distance blower sets from cupola, together with name of maker, catalogue size and number. If a Steel Pressure Blower is to be used for blowing forge fires, state the number and their size, whether small, ordinary or large, and most convenient location for blower. Customers will do well to forward a diagram of their forge shop with every order, and they will then be furnished with a plan of piping layout, if so desired.

"B" VOLUME BLOWERS AND EXHAUSTERS.—If for blowing furnace fires, give the square feet of grate surface and kind of fuel consumed. Bagasse and other refuse material require different proportioning of blower capacity than where coal or like fuel is used. Where "B" Exhausting Fans are to handle emery, or dust from other polishing spindles, state the size of each and number and purpose for which they are used; send a sketch to scale, showing their position in the room and intended location of exhauster; if for ventilation, give size of room, length, width and height, and length of pipes in all cases.

Buffalo Blowers and Exhausters,

Measurements of Blast Wheels.

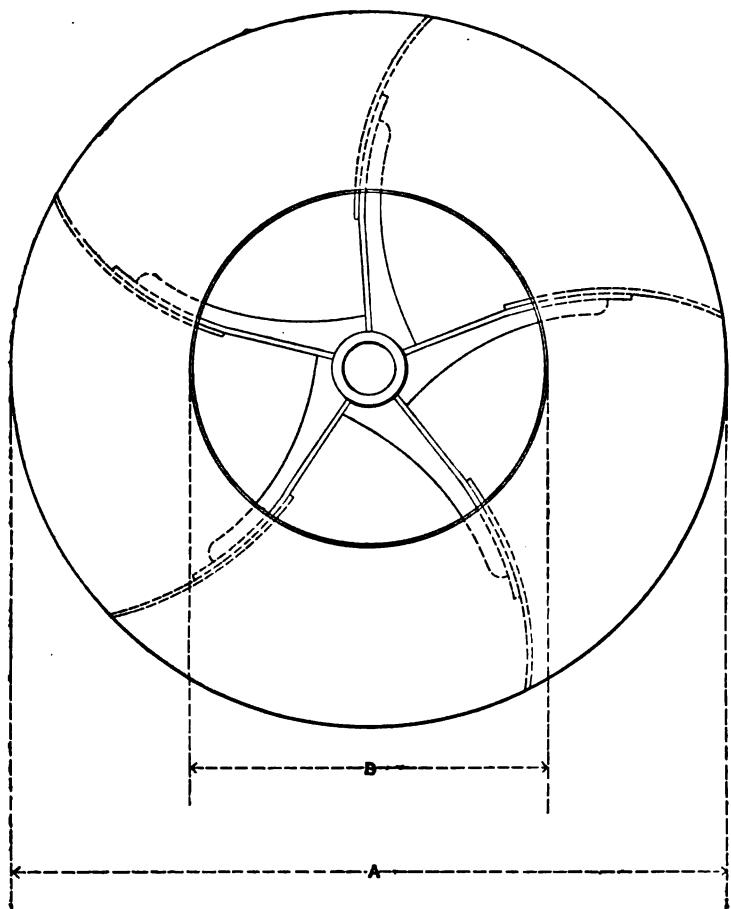


Fig. 1.

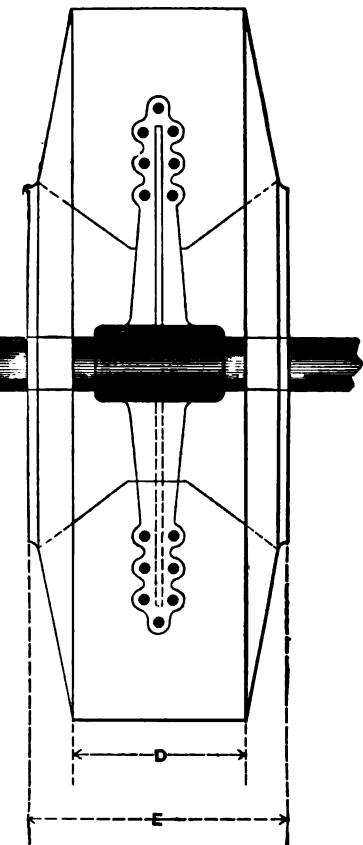


Fig. 2.

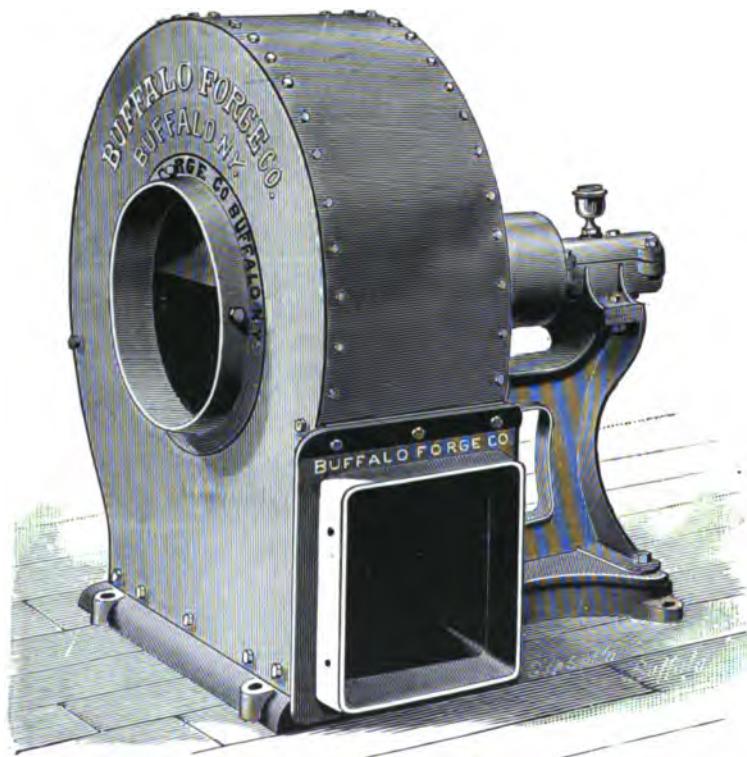
SELDOM is sufficient data or explanation given in ordering new blast wheels to enable execution without further correspondence, unless the old wheel is returned. If careful attention be given to the following instructions, much delay and annoyance will be obviated. State the catalogued style of fan, whether a Steel Pressure, or "B" Blower or Exhauster, Steel Plate Planing Mill Exhauster, Cotton Elevator, or a Steel Plate Pulley or Steam Fan, and whether the machine is a blower or an exhauster. Refer to the shop number, which is always stamped upon the shaft or end of the journal encasing it. Furnish a list of the principal dimensions of the wheel, which are indicated by the letters in the above outline cuts. Purchasers may either clip this diagram from the catalogue or refer to the page number, and state that the dimensions of "A," "B," and "C," etc., are a certain number of inches; these must be exact. When requested, an outline blue print will be sent, upon which these dimensions may be noted; this should be returned with the order. It will be observed that all the dimensions refer only to the wheel itself. It is well to state the diameter of the shaft.

The reader will readily understand that with these machines having been improved continually in the past, necessarily the dimensions have been varied as such changes are made.

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Buffalo Steel Plate Planing Mill Exhauster,

With Overhung Wheel.



Fan, Right Hand, Bottom Horizontal Discharge.

Buffalo Steel Plate Planing Mill Exhausters,

With Overhung Wheels.

CUSTOMERS ordering Buffalo Steel Plate Planing Mill Exhausters are requested to carefully observe "Suggestions to Purchasers" on page 156, and also the remarks on page 157, when requiring new blast wheels. Much annoyance and delay will be saved by complying with the above.

We always send right hand bottom horizontal discharge exhausters in the absence of other advices. For top horizontal, up blast, or other discharge than the regular bottom horizontal, price should be figured at 10 per cent. advance on list, this being the cost of the extra material and time consumed in making such style of exhausters.

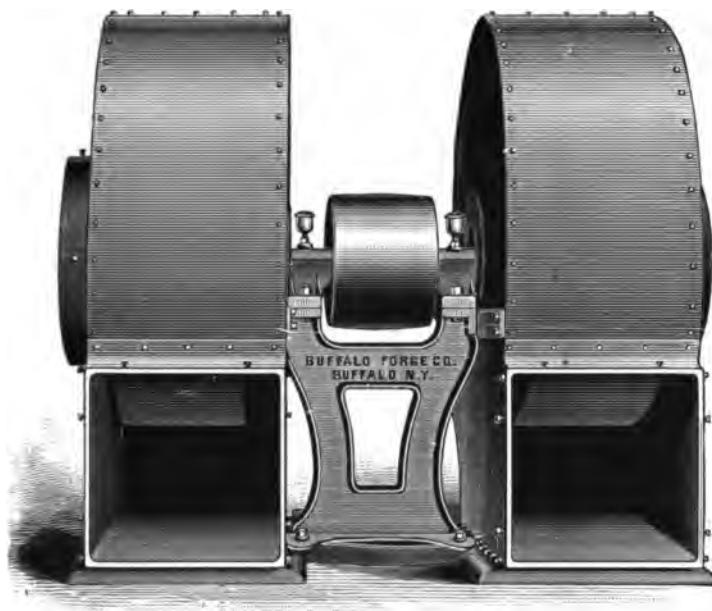
Purchasers should not be led to believe that because they are getting a fan with a larger inlet or outlet than Buffalo Exhausters, which are properly proportioned in every respect, they are securing a machine of greater efficiency. *Enlarged inlet and outlet rings bolted to the shell of an exhaust fan do not indicate its capacity, as some manufacturers claim.* The proportion of some fans in this regard, is such as to render their efficiency very low. The height of shell and diameter of blast wheel are the important dimensions and upon which the capacity of an exhaust fan depends. Particular attention is called to the journal bearings employed for Buffalo Fans —see page 164. Seeking only for the best, we have adopted and patented this oil ring bearing after years of experience, and offer it as unequaled by any fan journal on the market.

GUARANTEE.—Buffalo Steel Plate Exhausters, of both the single and double type, are guaranteed to be built of the best material in a thoroughly workmanlike manner, to run with less power, to be more durable, to be so proportioned as to give the greatest suction and explosive power obtainable, and to be sold at lower prices for the same size and capacity than those of any other manufacture. All machines having their component dimensions or proportions at variance with Buffalo Steel Plate Planing Mill Exhausters are either inordinate consumers of power or are of comparatively inferior capacity.

SINGLE FANS—PRICE LIST, SIZES AND DIMENSIONS.

SIZE	OUTSIDE DIAMETER OF INLET	OUTSIDE SIZE OF OUTLET	SINGLE FAN PULLEYS		PRICE OF SINGLE FANS
			Diameter	Face	
30 inch	11 $\frac{3}{8}$	9 $\frac{1}{2}$ x 9 $\frac{1}{2}$	6	4 $\frac{1}{2}$	\$ 55.00
35 "	13 $\frac{1}{8}$	11 $\frac{1}{2}$ x 11 $\frac{1}{2}$	7	5 $\frac{1}{2}$	70.00
40 "	14 $\frac{1}{8}$	13 $\frac{1}{2}$ x 13 $\frac{1}{2}$	8	6	90.00
45 "	17 $\frac{1}{8}$	15 x 15	9	6 $\frac{1}{2}$	115.00
50 "	19	16 $\frac{1}{2}$ x 16 $\frac{1}{2}$	10	7	150.00
55 "	20	18 x 18	11	8	185.00
60 "	22 $\frac{1}{2}$	19 $\frac{1}{2}$ x 19 $\frac{1}{2}$	11 $\frac{1}{2}$	9	200.00
70 "	24 $\frac{1}{2}$	22 x 22	12	10	250.00
80 "	30 $\frac{1}{2}$	26 x 26	14	10 $\frac{1}{2}$	300.00

Buffalo Steel Plate Double Planing Mill Exhauster,
With Overhung Wheels.



Double Type of Fan with Bottom Horizontal Discharge.

Buffalo Steel Plate Double Planing Mill Exhausters,

With Overhung Wheels.

THE construction of the Buffalo Steel Plate Double Exhausters is of the same superior order as is characteristic of the single fans. It is claimed by some manufacturers that the smaller diameters of exhausters are more effective than the larger ones, in proportion to their size. Exhausters running at the same velocity of wheel periphery in feet per minute, do not have greater expulsive power, neither will they blow stronger in small diameters than in large ones, operating under properly proportioned pipe connections. The advantage in using double exhausters, therefore, chiefly lies in the matter of convenience in application. In determining whether a single or double fan should be employed for a wood-working outfit, the proposed position of fan, and point at which discharge is to be made, will enter for consideration. With using a double exhauster, smaller pipes can often be used with fewer elbows or bends, and by locating fan centrally, the material to be moved has less distance to travel before reaching the fan. Less perpendicular space overhead is required than for a single exhauster of the same capacity, and only a single belt and single counter are required; all conditions being equal, however, there is no saving of power.

For certain duty, we occasionally build a special combination of two sizes of fans to operate as a double exhauster. Both being run by a common driving pulley, each fan necessarily makes the same number of revolutions, though greater capacity, of course, is secured in the larger.

On both single and double fans, self-oiling journal boxes (see page 164) of our own patent, and especially adapted for the arduous duty of shavings exhausters, are used exclusively. The finest babbitted bearings of extra length, steel journals, large self-oiling devices, and perfect alignment—the necessary characteristics for successful running at high speed—are employed, and a "hot-box," therefore, is unknown. The journals are all hardened after being turned, and then ground accurately to a standard gauge.

Purchasers should not be led to believe that, because they are getting a fan with larger inlet or outlet, they are securing an exhauster of greater efficiency. *Enlarged inlet and outlet rings bolted to the shell of an exhauster do not indicate its capacity, as some manufacturers claim.* The proportion of some fans in this regard is such as to render their efficiency very low. See guarantee on page 161.

Double exhausters are built either bottom or top horizontal, or up discharge; seldom larger sizes than given in table are required, though they can be built to order of any dimensions, if desired.

DOUBLE FANS—PRICE LIST, SIZES AND DIMENSIONS.

SIZE	OUTSIDE DIAMETER OF INLETS	OUTSIDE SIZE OF OUTLETS	DOUBLE FAN PULEYS		PRICE OF DOUBLE FANS
			Diameter	Face	
30 inch.	11 $\frac{1}{4}$	9 $\frac{1}{2}$ x 9 $\frac{1}{2}$	8	7	\$ 90.00
35 "	13 $\frac{1}{4}$	11 $\frac{1}{2}$ x 11 $\frac{1}{2}$	9	8	100.00
40 "	14 $\frac{1}{4}$	13 $\frac{1}{2}$ x 13 $\frac{1}{2}$	10	9	130.00
45 "	17 $\frac{1}{2}$	15 x 15	11	9 $\frac{1}{2}$	170.00
50 "	19	16 $\frac{1}{2}$ x 16 $\frac{1}{2}$	12	10	210.00
55 "	20 $\frac{1}{4}$	18 x 18	13	11	275.00
60 "	22 $\frac{1}{2}$	19 $\frac{1}{2}$ x 19 $\frac{1}{2}$	14	12	325.00

Buffalo Steel Plate Planing Mill Exhausters,

With Overhung Wheels.



Sectional View of Oil Ring Bearing.



End View of Oil Ring Bearing.



The Bearing Bracket.

The Self-oiling Journals are Identical with those on the Heating Fans, Excepting
the Rigid Type of Box is Employed.

Buffalo Steel Plate Exhausters,

With Overhung Wheels.

VARIOUS USES.—This type of fan is not only adapted for removing refuse from wood-working machinery, but is especially suited for a large number of other purposes. Prominent among these, are the removing of smoke and gases created by forges and furnaces in blacksmith shops. Half-tone illustrations follow later of interiors of Manual Training Schools where these fans are in operation for this use. The "B" Exhaust Fans are often employed for the same service, except when the number of forge fires is large.

Buffalo Steel Plate Exhausters have also been introduced into hundreds of factories for handling dust from emery grinders, buffing wheels, and the like. The "B" Volume type of Exhauster is also employed for this service, and is generally preferable to the steel plate exhausters even in the larger sizes. Cases frequently occur, however, where there are so great a number of emery spindles, that the largest "B" Exhauster is not sufficient to handle the work, whereupon the selection of a steel plate exhauster would give the additional capacity required, and, by building of extra heavy material, it will readily stand being driven up to a high pressure, if necessary.

In wood-pulp mills, the handling of bark in the process of manufacture of the pulp is now a common application, but the work necessitates a fan of unusual strength. In tanneries, for handling spent bark, these exhausters are now most successfully applied. In both the above instances, which require a fan of great strength, we build a special construction of exhauster with the casing and wheel of double thickness. This especially adapts the machine for the work which it is desired to accomplish.

For handling the long, stringy shavings produced in the many lines of wood-working manufacture, for example, barrels, staves, shingles, and green hardwood lumber, the Buffalo Steel Plate Exhausters are built with a special wheel made of extra heavy material, but after the general form of the regular cotton fan wheel, which obviates the opportunity for shavings to be caught and entangled upon the wheel when passing through the exhauster.

It is frequently desired to apply an exhauster for handling acid fumes, or air laden with steam from malt kilns, which readily attack and destroy steel and cast iron. To overcome these features, we build a special line of exhausters with copper or brass wheels, and line the fans with lead, copper, asphaltum, or other material not chemically affected by the gases to be handled. In the larger sizes, wood housing exhausters with the same special wheels are frequently employed, and may be readily furnished.

In chemical works and certain mining operations, it is occasionally desired to handle gases at a high temperature, frequently exceeding 500° Fahr. This may be successfully accomplished by the use of Buffalo Special Exhausters, made solely for this purpose. They are usually designed with water cooling boxes, so that the bearings and shaft are kept cool, permitting their continuous running, while the fan itself partakes of the temperature of the gases handled.

BUFFALO PATENTED OIL RING BEARINGS.—This oil ring type of bearing was first introduced and patented by us for use upon the celebrated Buffalo Steel Pressure Blowers. The service here demanded positively the most perfect bearing for rapidly rotating parts. As the device proved so great a desideratum for this service, the same bearing has been adopted, though with some variations, for all the different types of blowers and exhausters built by this house. The general principle of the bearings is shown by the engravings on opposite page, though the cuts are taken from the Heating Fan Journals, and show a different type. It will readily be appreciated, that a more positive or perfect bearing does not exist. The device is entirely automatic in action, the oil being constantly carried around the shaft by a ring, which will be seen by reference to the cut; it is thus impossible for the bearings to be without lubrication while there is oil in the chamber. The dimensions of the latter are ample, and the oil is not wasted. The ring operates perfectly quiet until the oil becomes low; when any noise is heard, it may be taken as a signal for re-filling. The bearings, however, will run for quite a time after the signal is noticed. A renewed supply of oil is not required oftener than once a week, even in continuous high speeds. Upon the point of requiring practically no attention, this improved bearing possesses merits unequaled by any oiling arrangement yet offered.

Buffalo Steel Plate Planing Mill Exhausters,

With Overhung Wheels.

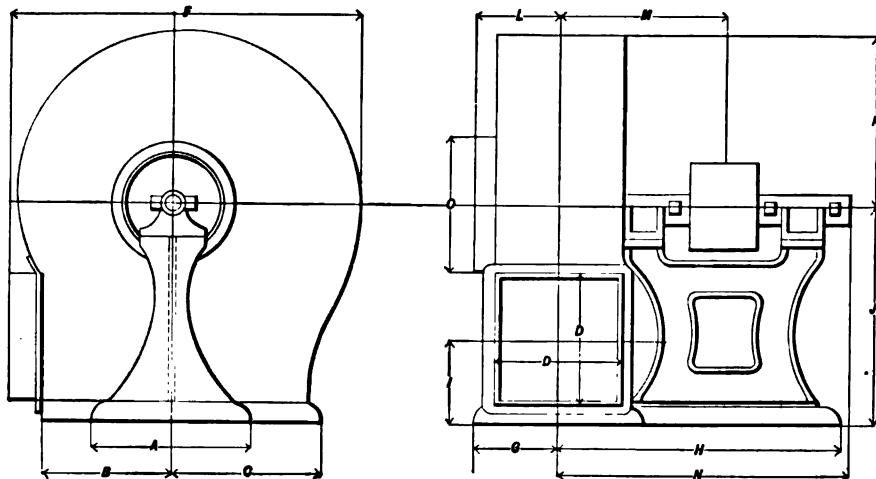


TABLE OF PRINCIPAL DIMENSIONS—IN INCHES.

SIZE	A	B	C	D	F	G	H	J	K	L	M	N	O	SIZE OF PULLEY		WEIGHT	
														Diam.	Face	Not Packed	Packed
30 in.	11 $\frac{1}{2}$	10 $\frac{1}{4}$	10 $\frac{1}{4}$	9 $\frac{1}{2}$	26	6 $\frac{1}{8}$	18	16 $\frac{1}{4}$	13	6 $\frac{1}{4}$	11 $\frac{1}{8}$	19	11 $\frac{1}{8}$	6	4 $\frac{1}{2}$	285	310
35 "	15 $\frac{1}{8}$	12 $\frac{1}{8}$	12 $\frac{1}{8}$	11 $\frac{1}{4}$	30 $\frac{1}{4}$	7 $\frac{1}{8}$	21 $\frac{1}{8}$	19 $\frac{1}{4}$	15 $\frac{1}{4}$	7 $\frac{1}{4}$	13 $\frac{1}{4}$	22 $\frac{1}{8}$	13 $\frac{1}{8}$	7	5 $\frac{1}{2}$	370	410
40 "	17 $\frac{1}{8}$	14 $\frac{1}{2}$	14 $\frac{1}{2}$	13 $\frac{1}{2}$	36	8 $\frac{1}{8}$	24 $\frac{1}{8}$	23	18	8 $\frac{1}{2}$	15 $\frac{1}{4}$	25	14 $\frac{1}{4}$	8	6	585	615
45 "	20	16 $\frac{1}{2}$	16 $\frac{1}{2}$	15	40 $\frac{1}{4}$	9 $\frac{1}{8}$	28	25 $\frac{1}{4}$	20 $\frac{1}{4}$	9 $\frac{1}{4}$	18	28 $\frac{1}{8}$	17 $\frac{1}{8}$	9	6 $\frac{1}{2}$	726	765
50 "	22 $\frac{1}{2}$	18	18	16 $\frac{1}{4}$	45	9 $\frac{1}{8}$	29 $\frac{1}{8}$	28 $\frac{1}{8}$	22 $\frac{1}{4}$	10 $\frac{1}{8}$	19 $\frac{1}{8}$	30 $\frac{1}{8}$	19	10	7	850	910
55 "	25	20 $\frac{1}{8}$	20 $\frac{1}{8}$	18	49 $\frac{1}{4}$	11 $\frac{1}{8}$	33	30 $\frac{1}{4}$	24 $\frac{1}{4}$	11	21	33 $\frac{1}{2}$	20 $\frac{1}{4}$	11	8	1076	1126
60 "	27 $\frac{1}{2}$	22 $\frac{1}{8}$	22 $\frac{1}{8}$	19 $\frac{1}{4}$	52 $\frac{1}{2}$	12	35 $\frac{1}{8}$	32	26 $\frac{1}{4}$	11 $\frac{1}{8}$	22 $\frac{1}{8}$	36 $\frac{1}{8}$	.22 $\frac{1}{2}$	11 $\frac{1}{2}$	9	1400	1500
70 "	30	23 $\frac{1}{8}$	23 $\frac{1}{8}$	22	57	13 $\frac{1}{4}$	39 $\frac{1}{4}$	36	28 $\frac{1}{4}$	13 $\frac{1}{4}$	25	39	24 $\frac{1}{4}$	12	10	1700	1825
80 "	33 $\frac{1}{4}$	25	25	26	71	16	41	44 $\frac{1}{2}$	35 $\frac{1}{2}$	15 $\frac{1}{2}$	26	43	30 $\frac{1}{2}$	14	10 $\frac{1}{2}$	2000	2150

The height "J" to center is the same on bottom horizontal, top horizontal and up discharge exhausters of the same size. The total height of all top horizontal discharge exhausters is double the dimension "J." Buffalo Double Exhausters are made from two single machines. All dimensions are the same for corresponding sizes, excepting width over all, which is: Size double 30-inch, 38 inches; size 35-inch, 47 $\frac{1}{2}$ inches; size 40-inch, 55 inches; size 45-inch, 58 inches; size 50-inch, 63 $\frac{1}{2}$ inches; size 55-inch, 70 inches; size 60-inch, 74 inches; size 70-inch, 80 inches.

Buffalo Steel Plate Planing Mill Exhausters,

With Overhung Wheels.

SUGGESTIONS TO USERS.—In ordering, always mention whether a right or left hand fan is desired, and, in addition, what style of discharge: whether bottom horizontal, top horizontal, or up blast discharge. A right hand machine has pulley on the right hand side as you stand facing the outlet; a left hand, has pulley on the left hand side, standing in the same position. The object of the special forms is to do away with extra bends in delivery pipe, to reduce the amount of floor space required, and to secure the maximum efficiency of a fan of a given size. Often a crossed belt will be required to run a bottom horizontal discharge exhauster, owing to the position in which it is placed, when the substitution of a top horizontal discharge will still deliver air in the same direction using an open belt, and thus overcome the objectionable feature of its being crossed.

Always state the number of wood-working machines from which the exhauster is to handle the refuse; give a clear description of each, with the name of maker. The best way is to furnish a drawing to scale or sketch with all distances given, indicating position of line shaft, direction it turns, proposed position of exhauster, and location of shaving house. A reference should be made as to the character of work to be performed, and whether lumber is hard or soft, wet or dry; give too much information, rather than too little. This data will enable us to intelligently select the size of fan suitable.

The size of a shaving exhauster required for every outfit must be determined by the size of the main or suction pipe; the size of this in its turn depends upon the sizes and total number of the branch pipes leading to the machines. Branch pipes must necessarily vary in diameters from 3 in. to 8 in., according to the machines to which they are connected, and their distances from the main pipe. For a distance from the main suction pipe exceeding 25 feet, the majority of branch pipes should be increased in diameter 20 per cent. for each additional 20 feet.

After computing the separate areas of branches, it will be found, in most cases, that the area for the main suction pipe after all branches have entered should be 15 to 20 per cent. in excess of the aggregate areas of these. It is always better to figure the exhauster large, in proportion to the work to be done, so that the fan will handle it easily, and thus have a reserve capacity, if it is desired to add additional machines to the wood-working outfit at any later period.

BUFFALO SHAVINGS AND DUST SEPARATOR.—A safe and efficient machine for collecting dust, shavings, etc., at the same time providing a free escape for air necessarily delivered by a Shavings Exhaust Fan in handling refuse material, is an indispensable mechanism in planing mills and other branches of industry in which exhaust fans are employed to convey fibrous material of any kind.

Primitive arrangements to perform the duty of a modern dust separator have consisted of a series of screens; these were commonly employed in the absence of anything better. Constant attention was required to prevent clogging up, and the back pressure upon fan has often been found to be so great as to render it practically inoperative.

The Improved Buffalo Separators are constructed of heavy sheet steel throughout, are positive in action at all times, and are so connected with the discharge pipe from fan that a minimum amount of back pressure is secured. After entering the dust separator, the refuse material from the wood-working machines drops by gravity out at the bottom, and can be led to the shaving bin, or conveyed directly into the boilers, the air passing out through opening left for the purpose.

The most common location for a dust collector is on the roof of shaving building, and in this position the discharge of air from the separator can be made directly into the open atmosphere. Where the application necessitates the locating of the separator inside of a building, it is then necessary to so lead a pipe from the air outlet of collector, that the discharge will be made into open air, with few turns or bends therein. The Buffalo Dust Separator is a compact, durable, absolutely noiseless machine, and customers are fully guaranteed against all costs for infringements of patents.

Buffalo Steel Plate Planing Mill Exhausters.

IN THE compilation of the following table, due allowance has been made for loss of peripheral velocity, and also for slipping of belt.

The Steel Plate Planing Mill Exhausters are often used for removing smoke from forge fires and other similar purposes. For such uses, operating under proper pipe connections, they will be found to yield sufficient suction when run at speeds given for average work, unless applied to too large a number of fires.

The successful and economical application of exhaust fans depends chiefly on the proper size, construction and proportion of the pipes and hoods, so as to have the least amount of loss by unnecessary friction in pipes, and to handle no more air at proper pressure than is necessary to convey the material.

TABLE OF SPEEDS FOR VARIOUS PRESSURES.

SINGLE FAN	FOR LIGHT WORK			FOR ORDINARY WORK			FOR HEAVY WORK			DOUBLE FAN
	2-oz. Pressure	2½-oz. Pressure	3-oz. Pressure	3½-oz. Pressure	4-oz. Pressure	4½-oz. Pressure	5-oz. Pressure	6-oz. Pressure	7-oz. Pressure	
	30 inch	1814	2020	2226	2402	2576	2732	2886	3168	3429	30 inch
35 "	1468	1634	1800	1942	2084	2210	2335	2563	2779	35 "
40 "	1285	1431	1577	1702	1825	1934	2045	2245	2429	40 "
45 "	1174	1308	1442	1555	1668	1768	1869	2037	2221	45 "
50 "	1082	1205	1327	1432	1536	1629	1721	1890	2045	50 "
55 "	964	1073	1184	1276	1369	1452	1534	1684	1823	55 "
60 "	882	982	1083	1168	1252	1328	1403	1540	1667	60 "
70 "	812	904	985	1075	1153	1223	1292	1419	1535	70 "

TABLE OF WEIGHTS OF GALVANIZED IRON PIPE, IN POUNDS, PER RUNNING FOOT.

DIAMETER OF PIPE IN INCHES	No. 24 GAUGE	No. 22 GAUGE	No. 20 GAUGE	No. 18 GAUGE	No. 16 GAUGE	DIAMETER OF PIPE IN INCHES	No. 24 GAUGE	No. 22 GAUGE	No. 20 GAUGE	No. 18 GAUGE	No. 16 GAUGE
4	1½	1¾	2	2½	3¼	28	9½	11½	14	18	21½
5	1¾	2	2½	3½	4	30	10	12½	15	19½	23
6	2	2½	3	4	4½	32	10½	13	16	21	24½
7	2½	3	3½	4½	5½	34	11½	14	17	22	26
8	2½	3½	4	5½	6½	36	12	15	18	24	27½
9	3½	3¾	4½	5¾	7	38	12½	16	19	25	29½
10	3½	4	5	6½	7½	40	13½	17	20	26½	31
11	3½	4½	5½	7	8½	42	18	21	28	33	
12	4	4½	6	7½	9	44	19	22	30	35	
13	4½	5	6½	8½	10	46	20	23	31½	37	
14	4½	5½	7	9	11	48	21	24	33	39	
15	5	6	7½	9½	12	50	22	25	35	41	
16	5½	6½	8	10½	13	52		26	36½	43	
18	6	7½	9	11½	14½	54		27	38½	45	
20	6½	8	10	12½	15½	56		28	40	47	
22	7½	8½	11	14	16½	58		29	42	49	
24	8	9½	12	15½	18½	60		30	44	51	
26	8½	10½	13	16½	20						

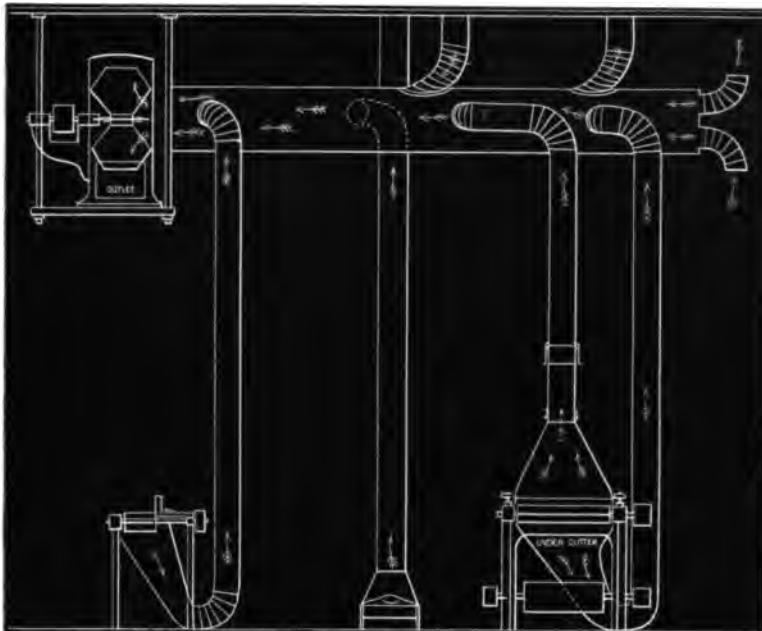
For planing mill work, pipes up to 8 inches diameter should be 24 gauge; 8 to 14 inches, 22 gauge; 14 to 20 inches, 20 gauge; 20 to 30 inches, 18 gauge; larger sizes for heavy work, 16 gauge.

Reference to table will show there is quite a difference in the weights of pipe made of the different gauges of iron. A foot of 30-inch pipe of 24 gauge iron weighs 10 pounds, while of 18 gauge it weighs 19½ pounds, with the item of labor in about the same proportion.

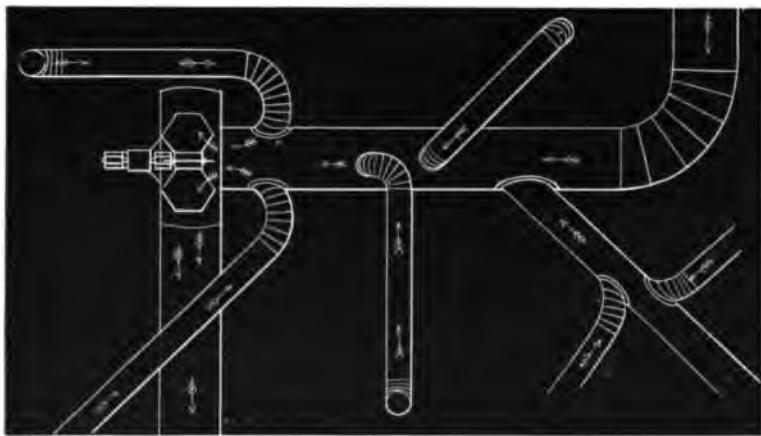
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Buffalo Steel Plate Planing Mill Exhauster,

Application of the Single Type.



Elevation, Fig. 1.



Plan, Fig. 2.

THE above engravings, Figs. 1 and 2, are presented as illustrating a practical example of shaving exhaust piping, well arranged and connected for efficient service. The larger portion of cut, or Fig. 1, shows an elevation of the exhauster and pipes, with side, top and end connections to the main. The smaller portion, or Fig. 2, exhibits a plan view, or looking directly at the outfit from the floor above. It will be observed that all connections enter at an angle in the direction of the movement of air toward the fan, and the branches enter the main pipe either at side or on top; always avoid connections at bottom of main or below its center. Adjustable hoods are very convenient for certain machines.

Buffalo Steel Plate Planing Mill Exhausters,

Hints in Applying to Wood-working Machinery.

LOCATION.—Always place the exhauster so as to have the course of the main suction and discharge pipes in as nearly a straight line as practicable from the inlet and outlet, respectively, of the fan, and as near the greater portion of the material to be carried away as possible. The main suction pipe leading to the fan inlet should never be tapered until the branch pipes leading to machines have reduced the power of suction to a smaller area, and an ordinary job will not require tapering oftener than once in 15 to 20 feet. Avoid taking out of the main suction pipes, two branches directly opposite each other. Connect the branches to the main pipe either at the side or above the center, never underneath the center line of the main pipe, but enter branches in main in the direction of movement of air toward exhauster. Make branch pipes as short as circumstances will permit, and in connecting them to hood over machines, avoid abrupt curves or bends.

The attempt to lower the cost of an effective outfit by the use of square wooden ducts as a substitute for galvanized iron, is not, generally speaking, economy. The expense of power is always greater, and the fan has to be driven at a higher speed to secure equal results.

HOODING MACHINES.—The proper form of construction of hoods is a very important factor in a piping outfit; more exhaust fans have been condemned from a lack of intelligence on this point than from any other cause. For the guidance of our patrons, we give on pages 169 to 175, illustrations, with different sizes, dimensions and forms of the various styles of hoods and hoppers for a wide variety of wood-working machinery. They are the result of many years' experience, and we have used them in a large number of the best planing mill equipments in the country. These hoods, necessarily, have to be made especially and fitted to the machines on the ground.

When hoods for the machines are made and proportioned as suggested by our diagrams, they cannot be fitted too closely to the wood-working machinery. Fit closely to the journal boxes, rollers and pressure bars of planers and molders, so that the supply of air must pass up and around the material that is being worked. Planer hoods, arranged with telescopic joints and counterbalance weights (see page 172), will be found very convenient of adjustment, as they permit raising from the machine when desired, and are less liable to become jammed than when put on floor. All turns or bends in pipes should be on an easy curve and in the direction of the moving air.

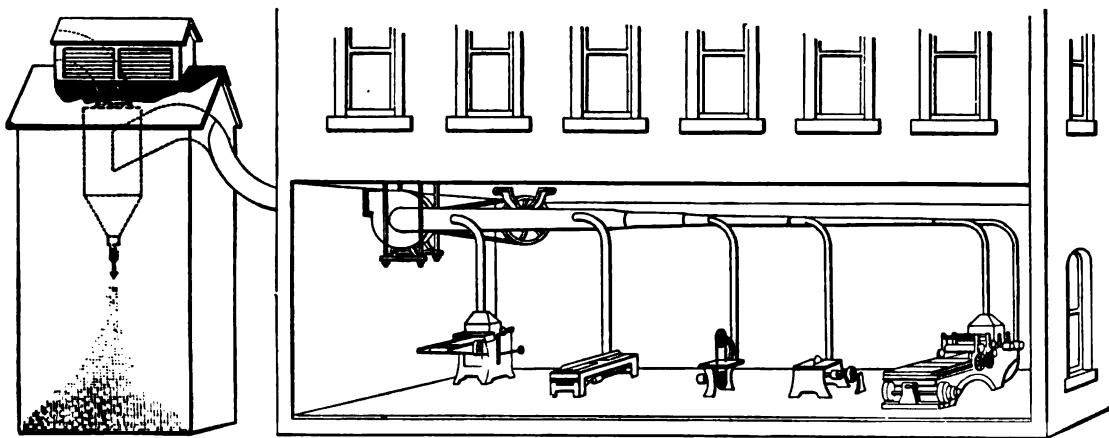
SIZES OF BRANCH PIPES FOR SAWS.—By reference to the outline cuts of hoods which follow, it will be an easy task to select the proper sizes of branch pipes for almost any variety of wood-working machinery. As very few of the different variety of saws are given herein, we append herewith a list, with the extreme sizes of branch pipes required in each instance. Many plants in daily operation are used with smaller diameters of pipes. This is partly dependent upon their length, as well as the condition of the material passing through the saw.

Rip Saws, all 18-inch and less	4-inch pipe.	Saw, Combination	5-inch pipe.
Cut-off Saws, all 18-inch and less	4 " "	Saw, Band	4 " "
Rip or Cut-off Saw, 24-inch or less	5 " "	Saw, Groove	4 " "
Split Saw	4 " "	Resaw, Endless, $\frac{1}{2}$ to 1-inch	5 " "
Belling Saw	5 to 6 " "	" 1 $\frac{1}{2}$ to 2 $\frac{1}{2}$ -inch	6 " "
Swing Circular Saws, 12 to 20-inch	4 " "	Resaw, Circular 18-inch	5 " "
Saws, Heavy Cut-off, 24-inch	6 " "	Resaw, 24 to 30-inch	6 " "

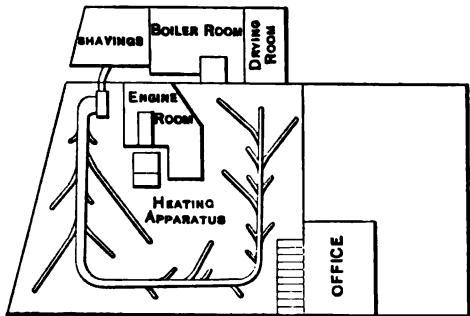
BLAST GATES.—All branches and "sweep-ups" (except the extreme end of the main pipe, which should always be left open), should have a blast gate or cut-off, that, when machine is not in use, by closing off the branch, there will be economy of power. Each cut-off should be provided with an opening in the center of slide from 1 $\frac{1}{2}$ to 2 inches in diameter, according to the size of the branch pipe. The object of these openings is to maintain a sufficient current of air through the branch pipes when not in use to avoid clogging them by the passage of refuse from other branches through the main pipe.

Buffalo Steel Plate Planing Mill Exhausters,

An Effective Application.



Sectional View, Fig. 1.



Plan View, Fig. 2.

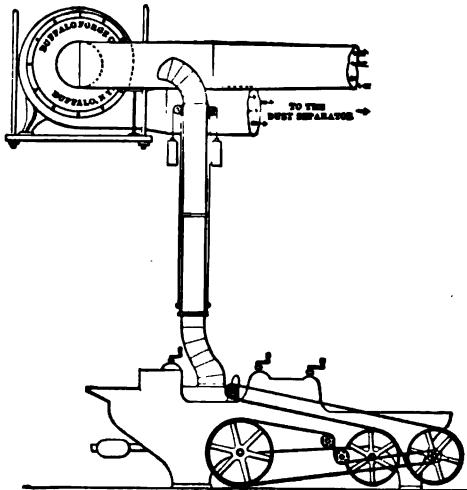
drive it. The maximum efficiency of any fan cannot be secured when it is operating in conjunction with right-angled elbows or with sharp bends and turns.

In the small engraving, Fig. 2, we have a plan of a shaving exhaust outfit. It will be observed that the shaving vault is located in close communication to the boiler room, and arrangement may be made for the feeding of the shavings direct into the boiler, or they may be deposited in a bin provided for the purpose and used as needed. Convenient progressive dry kilns are at the right of the boiler house, the green stock being introduced therein at the opposite side, and gradually brought into the factory from the hot end of kiln, as it becomes dry and is needed to work into manufactured goods. A mere outline of the heating apparatus is shown; it is a hot blast plant utilizing the exhaust steam from the engine, which is ordinarily sufficient for heating the works, excepting in extreme weather. Conveying pipes lead therefrom to the upper stories, in which are located the finishing rooms, etc.

Sufficient data is embodied in accompanying pages to enable customers to estimate the size of exhaust fan required for any outfit. The size of exhauster is dependent upon the size of the main suction pipe, which in its turn is regulated by the total areas of the branch pipes leading to the machines.

Buffalo Steel Plate Planing Mill Exhausters,

General Applications.



Planer Hood with Counterbalance
Weight.

In all cases of planer hoods, fit closely around journal bearings at end of hoods. Stay sides of hoods at bottom with angle iron. Always take off, or turn up, the hood on machine which directs the shavings forward; the shavings will then be thrown directly into the pipe connection to hood, and prevent their dropping back upon the material being worked. Under cutter hoods should be fitted as closely as possible under the cylinder, so that the shavings will drop down into the pipes connected with same.

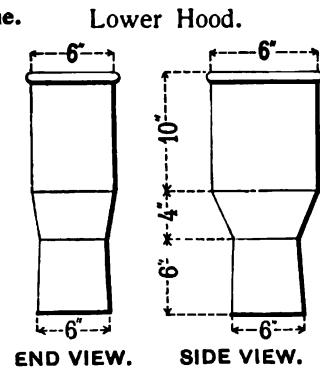
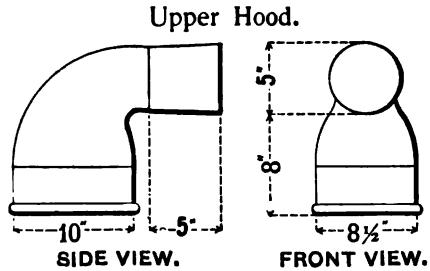
Saw benches and buzz-planers or jointers should have hoppers of wood or metal underneath, with pipe connections above or under the floor, as may be most convenient. Put a rack or netting into hopper, to catch slivers or pieces that may pass down by the saw, on the side. This will prevent clogging of the pipe. Floor "clean-ups," or sweepers, may be made of metal or wood, with slide door in side; this should be kept closed when not in use. Pipe to this should not be less than five or six inches in diameter.

Herewith we append a list of wood-working machines, with the sizes of pipes, etc., required in each instance, which are not illustrated or referred to in the following wax cuts: Planer with knives 28 to 36 inches long, requires 7-inch pipe; Planer with knives 24 to 26 inches long, 6-inch pipe; Buzz Planer with knives 30 inches long, 6-inch pipe; Universal Wood Worker, two 6-inch and two 5-inch pipes; Gainer, 5-inch pipe; Dado, 5-inch pipe; Panel Riser, 4 to 5-inch pipe; Rounder each head 5-inch pipe; Drum Sander with knives 12 to 15 inches, 5-inch pipe; Drum Sander with knives 20 to 28 inches, 6-inch pipe; Drum Sander with knives 30 to 40 inches, 7-inch pipe; Sand Belts, 5-inch pipe; Invincible Sanders, 7 to 8 inch pipe; Vertical Sander, 6-inch pipe; Swing Sander, 5-inch pipe; Dovetailing Machine, 5-inch pipe

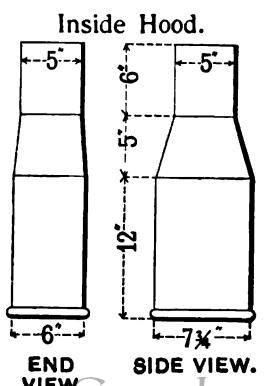
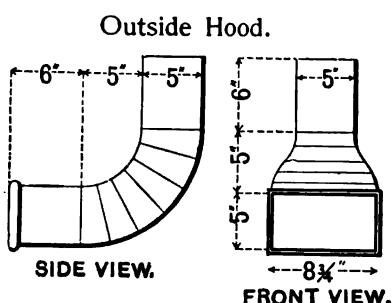
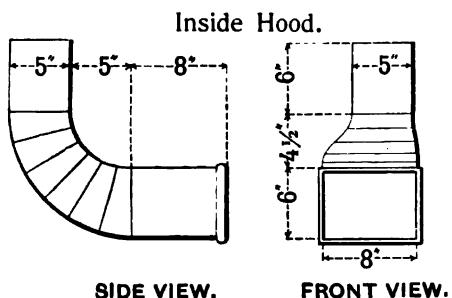
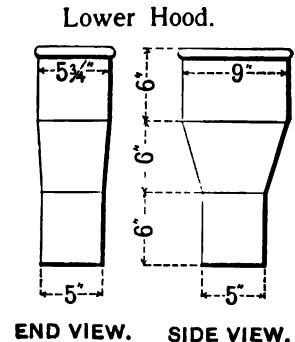
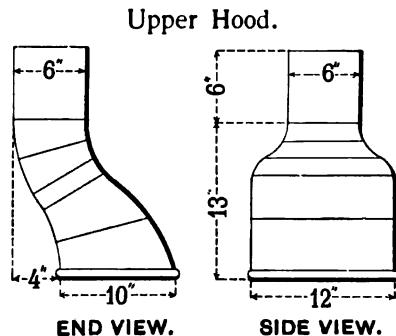
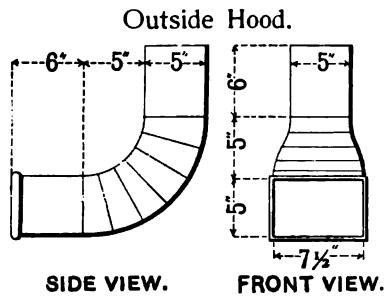
Buffalo Steel Plate Planing Mill Exhausters,

General Application.

Hood Form for Tenoning Machine.



Hood Forms for Sticker Machines.

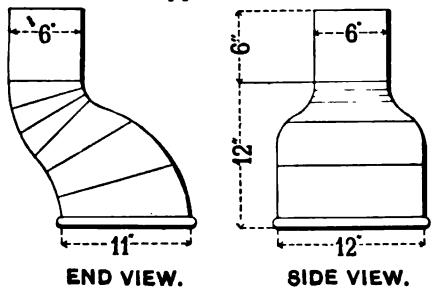


Buffalo Steel Plate Planing Mill Exhausters,

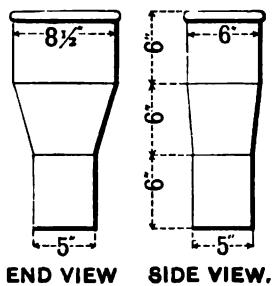
General Application.

Hood Forms for Sticker Machines.

Upper Hood.

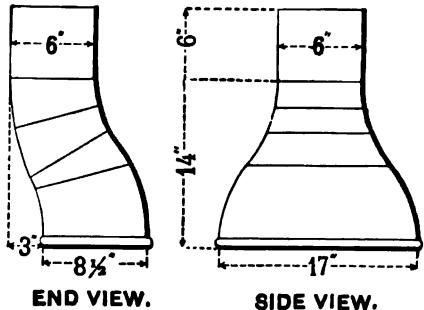


Lower Hood.

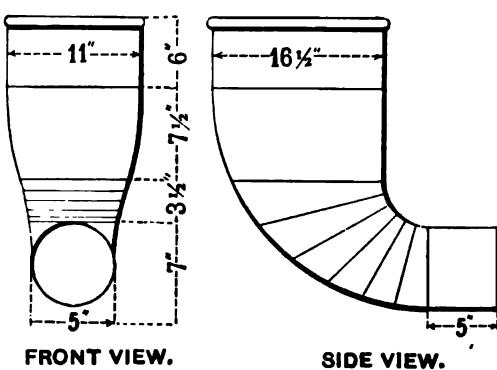


Hood Forms for Double Matcher and Flooring Machine.

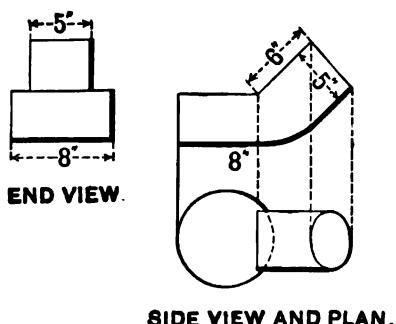
Upper Hood.



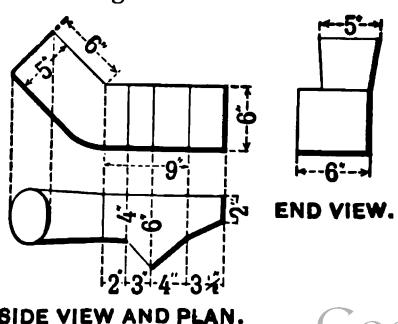
Lower Hood.



Left Hand Hood.



Right Hand Hood.

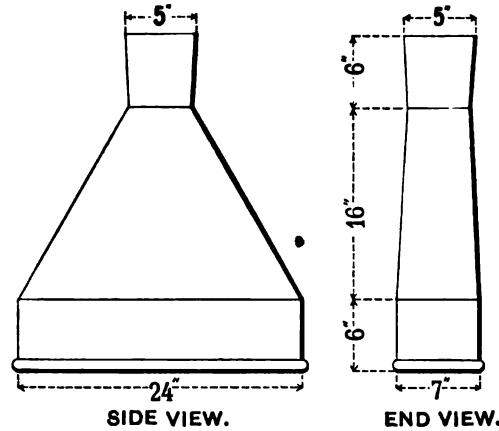


Buffalo Steel Plate Planing Mill Exhausters,

General Application.

Hood Forms for Double Matcher and Flooring Machine.

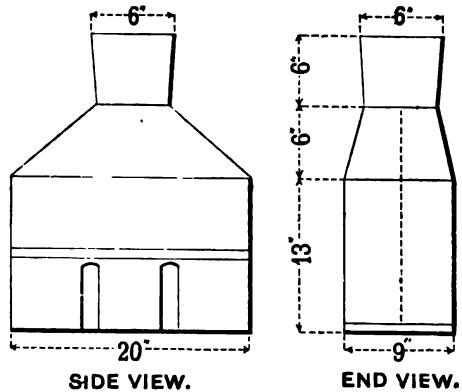
Form for Pony Planer Hood.



SIDE VIEW.

END VIEW.

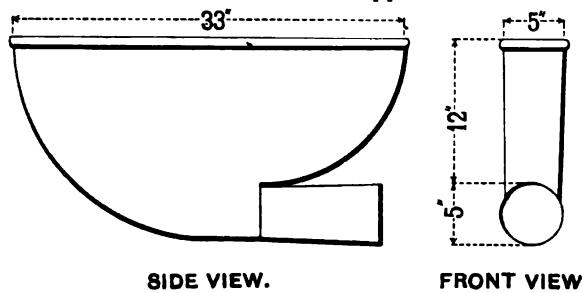
Form for Shaping Machine Hood.



SIDE VIEW.

END VIEW.

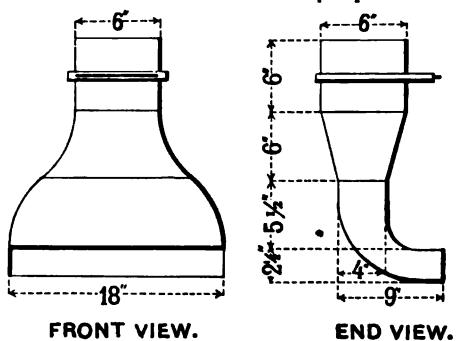
Form of Resaw Hopper.



SIDE VIEW.

FRONT VIEW

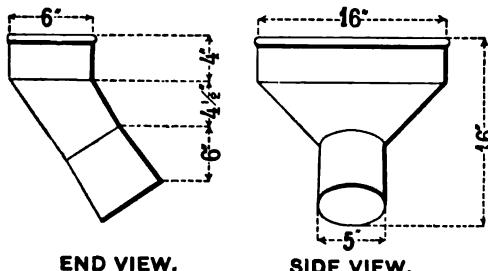
Form of Floor Sweep-up.



FRONT VIEW.

END VIEW.

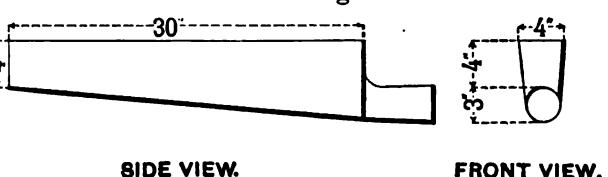
Form of Jointer Hood.



END VIEW.

SIDE VIEW.

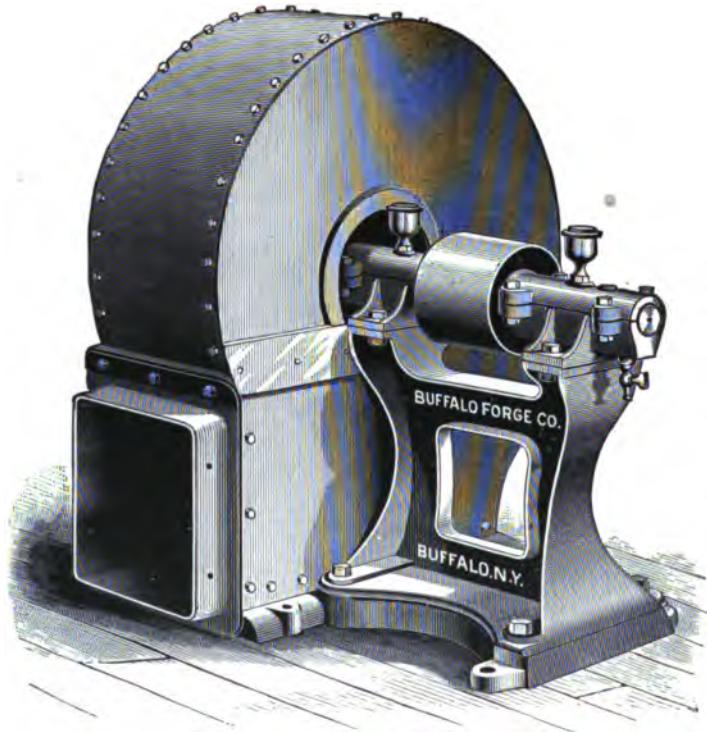
Form of Hood for Swing Cut-off Saw.



SIDE VIEW.

FRONT VIEW.

Buffalo Steel Plate Cotton Elevator, With Overhung Wheel.



Fan, Right Hand, Bottom Horizontal Discharge. Particularly Adapted for Use in Connection with Cotton Separators.

• Buffalo Steel Plate Cotton Elevators,

With Overhung Wheels.

THESE elevators are particularly adapted for use in connection with cotton separators, and are primarily designed for elevating seed cotton, cotton seed, cotton hulls, and various fibrous material of similar texture and nature.

The construction of these fans is nearly identical with the regular Buffalo Steel Plate Planing Mill Exhausters, their external appearance being exactly the same. The same high quality of material is employed, and practically the only difference between the two types of fans lies in the construction of the blast wheels. These are so formed that there is no opportunity for the catching or lodging of cotton, with the accompanying result of clogging and obstructing the operation of the elevator.

In the table which follows, the division, "Revolutions per Minute," exhibits the highest and lowest speeds required. It is impossible to name the exact speed a steel plate exhauster should run at, in every instance, for the reason that this is directly dependent upon the length of pipes, number of turns, and the strength of suction required. Damp and dirty cotton will require heavier suction of air to lift it, than dry, light and loose material. A too great speed of the fan causes some of the cotton to hull, with the attendant outcome of some of the husks or seed covers passing through the gin, injuring the product.

Buffalo Steel Plate Cotton Elevators are built right or left hand, with bottom horizontal and top horizontal discharge. They may also be furnished down blast or up blast, though seldom required in these discharges for this work. Right hand bottom horizontal discharge is always sent in the absence of other advices. Attention is directed to "Suggestions to Purchasers" on page 156. Buyers should not be led to believe that, because they are getting a fan with a larger inlet or outlet than employed for Buffalo Exhausters of a given height, which are properly proportioned in every respect, they are securing a fan of greater efficiency. *Enlarged inlet and outlet rings bolted to the shell of an exhauster, do not indicate its capacity, as some manufacturers claim.* The proportion of some fans in this respect is such as to render their efficiency very low. The height of shell and diameter of blast wheel are the important dimensions and upon which the capacity of a cotton elevator depends.

The bearings used on these fans are clearly illustrated by the cuts on page 164. Nothing heretofore produced can equal them. For detailed dimensions of the different sizes of Buffalo Steel Plate Cotton Elevators refer to page 166.

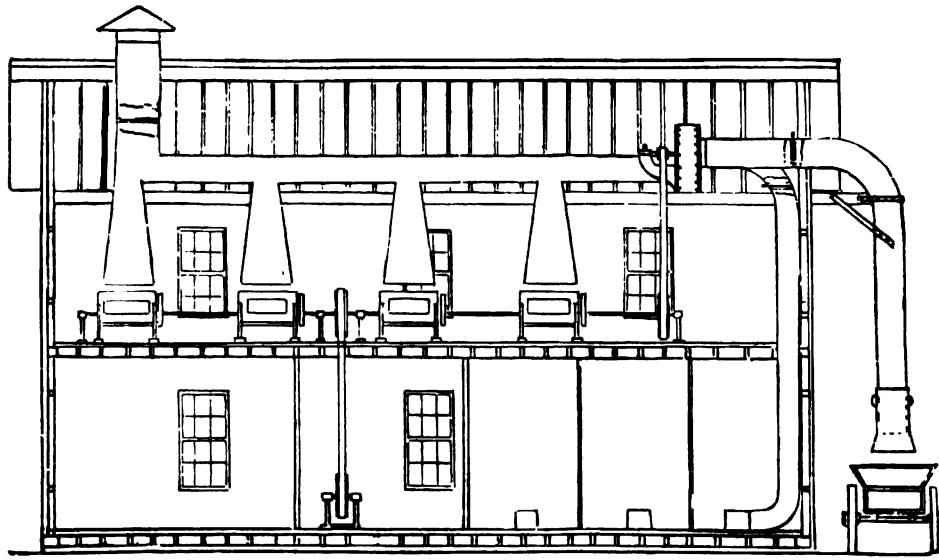
GUARANTEE. Buffalo Steel Plate Cotton Elevators are guaranteed to be built of the best material, in a thoroughly workmanlike manner, to run with as little power, to be as durable, to be so proportioned as to give the greatest suction and expulsive power obtainable, and to be sold at lower prices for the same size and capacity than those of any other manufacture.

PRICE LIST, CAPACITY AND SPEED.

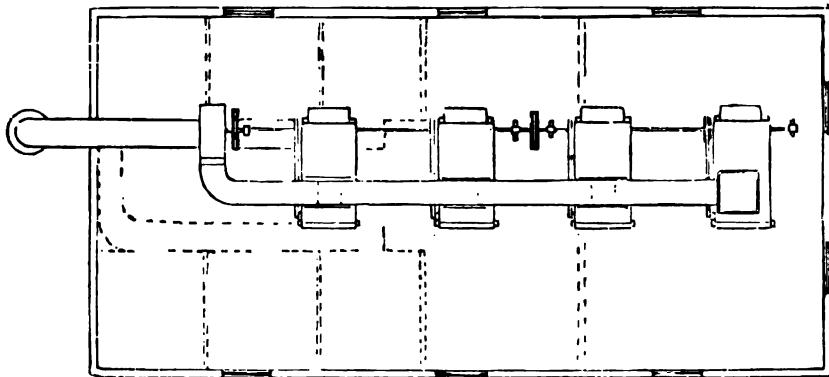
SIZE OF MACHINE	SIZE OF OUTLET	OUTSIDE DIAMETER OF INLET	DIAMETER AND FACE OF PULLEY	REVOLUTIONS PER MINUTE	CAPACITY IN POUNDS PER MINUTE	PRICE
30 in.	9 $\frac{1}{2}$ in. x 9 $\frac{1}{2}$ in.	11 $\frac{3}{8}$ in.	6 in. x 4 $\frac{1}{2}$ in.	1500 to 2000	3500 to 5000	\$ 55.00
35 "	11 $\frac{1}{2}$ " x 11 $\frac{1}{2}$ "	13 $\frac{1}{8}$ "	7 " x 5 $\frac{1}{2}$ "	1200 to 1800	4000 to 6000	70.00
40 "	13 $\frac{1}{2}$ " x 13 $\frac{1}{2}$ "	14 $\frac{1}{8}$ "	8 " x 6 " "	1100 to 1500	4500 to 6500	90.00
45 "	15 " x 15 "	17 $\frac{1}{8}$ "	9 " x 6 $\frac{1}{2}$ "	950 to 1350	5000 to 6800	115.00
50 "	16 $\frac{1}{2}$ " x 16 $\frac{1}{2}$ "	19 "	10 " x 7 " "	800 to 1200	5500 to 7200	150.00
55 "	18 " x 18 "	20 $\frac{1}{2}$ "	11 " x 8 " "	850 to 1100	6000 to 7600	185.00
60 "	19 $\frac{1}{2}$ " x 19 $\frac{1}{2}$ "	22 $\frac{1}{2}$ "	11 $\frac{1}{2}$ " x 9 " "	750 to 1000	6500 to 8500	200.00

Buffalo Steel Plate Cotton Elevators,

A Common Form of Application.



Application to Gin and Store House. Fig. 1.



Application to Gin and Store House. Fig. 2.

Buffalo Steel Plate Cotton Elevators,

With Overhung Wheels.

ASIDE from the efficiency of the Buffalo Steel Plate Cotton Fans as elevators of this material, they have found great favor with ginners throughout the country, as a cleaner and dryer.

The blades of the fan are so constructed that clogging up is a feature entirely unknown to Buffalo Cotton Elevators. The seed cotton passes over an easy curve of the wheel to the outlet of the fan case, thereby totally preventing all friction of cotton between the fan wheel and the shell. Fire arising from the use of certain cotton elevators is not an uncommon occurrence with those whose construction is such that there is considerable friction between the metallic surfaces. In the Buffalo Steel Plate Cotton Elevator Fans, this danger is eliminated. The cotton is so thoroughly picked apart, opened up and separated, that wads are absolutely prevented. Such dust as may be present in the material is easily eradicated by the action of the fan blades in opening up the material and the attendant rapid current of air.

It is a well known fact to cotton ginners throughout the country, that dirty and damp cotton, by the use of an ordinary elevator, will be delivered from the gin without a change in its quality. Several grades of improvements have been noted when handled by a Buffalo Steel Plate Fan.

As the reader will readily observe by a reference to the engravings upon the opposite page, the main suction pipe from the exhauster communicates as directly as possible, avoiding numerous bends, with the wagon or point at which the material is taken up. A properly proportioned and shaped hood, with a telescopic joint and the usual counterbalancing weights, in taking cotton from a wagon, will be found indispensable in a conveniently arranged outfit.

After the cotton passes through the fan, the discharge may lead to the gin or storehouse, as desired. Provision may also be made for discharging temporarily, a portion or all of the material into bins, and by the use of dampers, and branch pipes so arranged to direct the suction of the exhauster from the bins, the cotton may afterward be again passed through it, and then lead to the gin. Frequently, the above is a very desirable feature. Drawings of all such special layouts will be cheerfully furnished with every order, but it is always necessary for purchasers to send sketches to scale of their buildings, in order to enable the preparation of such plans.

Special attention is directed to the unique and unsurpassed bearing and oiling device used exclusively on Buffalo Steel Plate Cotton Elevators, which is clearly shown by the detailed engraving on page 164. These fans are particularly adapted for use in connection with cotton separators.

Purchasers ordering Buffalo Steel Plate Cotton Elevators should state in all cases whether a right or left hand fan is wanted. The fans used for elevating cotton are built right or left hand, with bottom horizontal discharge, top horizontal discharge; they may also be built down blast and up blast, though seldom required in these discharges for this work. We always send right hand bottom horizontal discharge fans in the absence of other advices. Purchasers should not be led to believe, because they are getting a fan with larger inlet or outlet than Buffalo Exhausters, which are properly proportioned in every respect, that they are securing a fan of greater efficiency. *Enlarged inlet and outlet rings bolted to the shell of an exhauster do not indicate its capacity, as some manufacturers claim.* The proportion of some fans in this respect is such as to render their efficiency very low. The height of shell and diameter of blast wheel are the important dimensions, and upon which the capacity of a cotton elevator depends.

Buffalo Steel Pressure Blower,

For Foundry Cupolas and Forge Fires.



Latest Improved Form of Construction.

Buffalo Steel Pressure Blowers,

For Cupola Furnaces and Forge Fires.

ON THE opposite page is shown the latest improved construction form of the Buffalo Steel Pressure Blower. A distinguishing feature of these blowers, common to those of no other manufacture of the same type, is the solid case, the peripheral portion of the shell being cast in one solid piece, to which the center plates are accurately fitted, metal to metal. It will thus be seen that the objectionable and slovenly "putty joint" is entirely dispensed with. Ready access to the interior of the blower, without entirely taking it apart, is also thus afforded. With blowers of every other manufacture, the "putty joint" feature of the shell or casing is an indispensable adjunct, although it is a construction point which is, at the best, something to be avoided in an efficient machine.

The Buffalo Steel Pressure Blowers are designed and constructed especially for high pressure duty, such as supplying blast for cupolas, furnaces, forge fires, sand blast machines, for any work requiring forcing of air long distances, as in connection with pneumatic tube delivery systems. They are adapted for all uses where a high pressure or strong blast of air is required. The journals are long and heavy, in the standard ratio of length to diameter of six to one, and embody a greater amount of wearing surface than those upon blowers of any other construction. Attention is directed to the special cuts and description of the patented journals and oiling devices employed on these blowers, which are unique features. The bearings are readily adjustable, and any wear can be taken up, which is an important point attending the durability and quiet running of a perfect machine.

Buffalo Steel Pressure Blowers possess the fewest number of parts of any like machines; in fact, the blower is practically one piece, so that under any service the bearings invariably are in perfect alignment, vertically and laterally, with the rest of the machine. In the items of durability, smooth running and economy of power, they are thus rendered far superior to any blower with the so-called universal journal bearing which is commonly employed.

In every point of construction, the greatest pains have been taken to simplify all parts and at the same time to give them the greatest strength. To adjust, repair and keep in order a Buffalo Blower, is a very small matter, and readily understood by a machinist of average ability.

For obtaining the best results from a blower of given size, when used for melting iron in foundry cupolas, much depends upon the proper layout of the blast piping between the blower and the cupola, and also upon the proper proportionment, arrangement and design of the cupola tuyeres. Several forms of cupolas are now upon the market, economical in the use of fuel and fast melting, which are the points most sought for in cupola construction. It is a common but erroneous idea that a blower large for the work, will give better results in a given diameter of cupola, than a smaller one. In the tables which follow, we give the proper sizes of Buffalo Blowers for different diameters of cupolas; but it must be borne in mind, that if the tuyerage is not of sufficient area, or if the blower has to be located at some distance from the work to be accomplished, these points enter for consideration. Frequently, foundrymen, when experiencing difficulty in obtaining satisfactory melts, throw the whole cause of the trouble upon the blower, when the fault does not lie at this point. This house has taken occasion to preserve data respecting the melts of cupolas of various types of construction, under different conditions commonly met, which we will be pleased to supply to customers. It is safe to say that failures are due more largely to the mismanagement of a cupola and improper application of the blower, than to any other cause.

Buffalo Steel Pressure Blowers are especially adapted for foundry cupolas, and are guaranteed to produce stronger blast with the least expense for power, than any others. They have found great favor with owners, who have previously employed other construction forms, and in numerous instances of large foundry plants with several cupolas, where used side by side with other blowers, have been found to yield superior results, oftentimes being afterward adopted for the entire equipment.

Every purchaser of a Buffalo Steel Pressure Blower will be supplied with a sketch showing proper size of blast pipe and connections to tuyeres, if desired, and sufficient data to enable us to prepare same if forwarded.

Buffalo Steel Pressure Blowers,

Furnished With or Without Countershfts.

BUFFALO Steel Pressure Blowers, priced in the table appearing below, are of the regular construction, and Nos. 1 to 6 have but one pulley; Nos. 7 to 12, inclusive, have two pulleys. For table of principal dimensions, see page 183. An illustration of the countershafts employed with these blowers appears on page 197, with table of detailed dimensions on page 199.

BUFFALO SPECIAL STEEL PRESSURE BLOWER.—On page 184, we illustrate a Buffalo Special Steel Pressure Blower having the countershaft affixed to the shell of the blower, the two being cast in one piece. As will be observed, tight and loose pulleys are provided, with a main driving pulley from which motion is transmitted to the blower itself. These blowers are built only in the smallest size, No. 1, though they can readily be constructed to order in a few larger sizes, if desired. The price for the No. 1, with affixed countershaft, as illustrated, is \$20.00.

GUARANTEE.—Buffalo Steel Pressure Blowers are guaranteed to be built of the best material and workmanship, in a thoroughly workmanlike manner, to be of superior design, run with less power, to be more durable and be so proportioned as to give stronger blast, and to be sold at lower prices for the same size or capacity, than those of any other manufacture.

NUMBER OF BLOWER	HEIGHT IN INCHES.	OUTSIDE DIAMETER OF OUTLET	DIAMETER OF PULLEY	FACE OF PULLEY	DIAMETER OF BEARING	LENGTH OF BEARING	PRICE WITHOUT COUNTERSHAFT	PRICE WITH COUNTERSHAFT
1	12 $\frac{1}{2}$	3 $\frac{1}{2}$	2 $\frac{1}{2}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$	3 $\frac{1}{2}$	\$ 12.00	\$ 20.00
2	15	4	2 $\frac{1}{2}$	2 $\frac{1}{2}$	2	3 $\frac{1}{2}$	18.00	28.00
3	20	4 $\frac{1}{2}$	3 $\frac{1}{2}$	2 $\frac{1}{2}$	2	4 $\frac{1}{2}$	26.00	38.00
4	24	5 $\frac{1}{2}$	4	3	2	4 $\frac{1}{2}$	36.00	52.00
5	26	5 $\frac{1}{2}$	4 $\frac{1}{2}$	3	1	5 $\frac{1}{2}$	44.00	64.00
6	30	6 $\frac{1}{2}$	4 $\frac{1}{2}$	3 $\frac{1}{2}$	1 $\frac{1}{2}$	6 $\frac{1}{2}$	55.00	80.00
7	35	7 $\frac{1}{2}$	5	4 $\frac{1}{2}$	1 $\frac{1}{2}$	6 $\frac{1}{2}$	70.00	100.00
8	40	8 $\frac{1}{2}$	6	4 $\frac{1}{2}$	1 $\frac{1}{2}$	7 $\frac{1}{2}$	90.00	130.00
9	45	10	7	5	1 $\frac{1}{2}$	8 $\frac{1}{2}$	115.00	170.00
10	56	12 $\frac{1}{2}$	8	5 $\frac{1}{2}$	1 $\frac{1}{2}$	8 $\frac{1}{2}$	160.00	230.00
11	66	14 $\frac{3}{8}$	9	6 $\frac{1}{2}$	1 $\frac{1}{2}$	9 $\frac{1}{2}$	225.00	300.00
11 $\frac{1}{2}$	76	16 $\frac{1}{2}$	10	7	1 $\frac{1}{2}$	10	275.00	350.00
12	80	18	10	8	2	11	325.00	400.00

Buffalo Steel Pressure Blowers,

For Cupolas and Forge Fires.

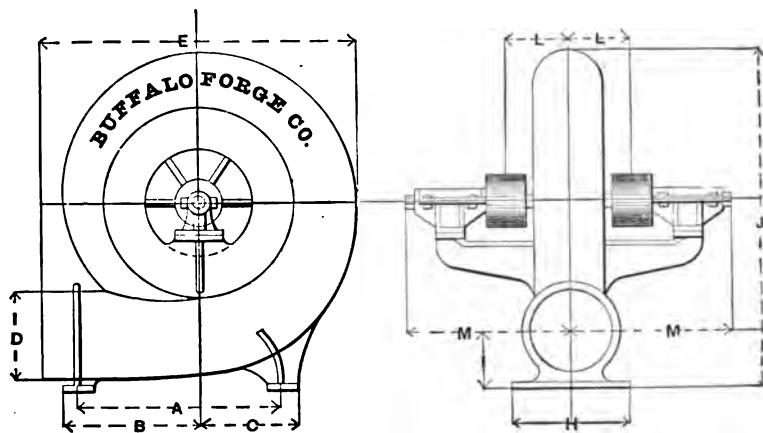


TABLE OF PRINCIPAL DIMENSIONS—IN INCHES.

No.	A	B	C	D	E	G	H	I	J	L	M	SIZE OF PULLEY		WEIGHT	
												Diam.	Face	Not Packed	Packed
1	7 $\frac{1}{2}$	6	2 $\frac{1}{4}$	3 $\frac{1}{4}$	12 $\frac{1}{2}$	6	8	2 $\frac{1}{2}$	12 $\frac{1}{2}$	3	14 $\frac{1}{2}$	2 $\frac{1}{4}$	1 $\frac{1}{4}$	30	45
2	10	7 $\frac{1}{2}$	4 $\frac{1}{2}$	4	15	6 $\frac{1}{2}$	7 $\frac{1}{2}$	2 $\frac{1}{2}$	15 $\frac{1}{2}$	4 $\frac{1}{2}$	16 $\frac{1}{2}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$	47	70
3	12 $\frac{1}{4}$	10 $\frac{1}{2}$	4 $\frac{1}{2}$	4 $\frac{1}{2}$	19 $\frac{1}{2}$	7	8 $\frac{1}{2}$	3 $\frac{1}{2}$	19 $\frac{1}{2}$	4 $\frac{1}{2}$	22 $\frac{1}{2}$	3 $\frac{1}{4}$	2 $\frac{1}{2}$	75	95
4	15	11 $\frac{1}{2}$	5 $\frac{1}{2}$	5	22 $\frac{1}{2}$	9	11	4 $\frac{1}{2}$	24	4 $\frac{1}{2}$	24 $\frac{1}{2}$	4	3	118	135
5	15 $\frac{1}{4}$	12 $\frac{1}{4}$	5 $\frac{1}{2}$	5 $\frac{1}{2}$	26 $\frac{1}{2}$	11 $\frac{1}{2}$	13 $\frac{1}{2}$	4 $\frac{1}{2}$	25 $\frac{1}{2}$	4 $\frac{1}{2}$	26	4 $\frac{1}{2}$	3	165	190
6	18 $\frac{1}{4}$	14	7 $\frac{1}{2}$	6	29	13	15	6	30	5 $\frac{1}{2}$	29	4 $\frac{1}{2}$	3 $\frac{1}{2}$	210	235
7	21 $\frac{1}{2}$	14 $\frac{1}{2}$	10	7 $\frac{1}{2}$	31	13 $\frac{1}{2}$	15 $\frac{1}{4}$	7	35 $\frac{1}{2}$	6 $\frac{1}{2}$	37 $\frac{1}{4}$	5	4 $\frac{1}{2}$	310	335
8	29 $\frac{1}{2}$	16	13 $\frac{1}{2}$	8 $\frac{1}{4}$	37	15	18	8 $\frac{1}{2}$	37 $\frac{1}{4}$	7 $\frac{1}{2}$	43 $\frac{1}{4}$	6	4 $\frac{1}{2}$	450	490
9	32	19 $\frac{1}{2}$	16	10	42	16	19	9 $\frac{1}{2}$	44	8 $\frac{1}{2}$	46 $\frac{1}{2}$	7	5	620	660
10	40	21 $\frac{1}{2}$	22	12 $\frac{1}{4}$	53 $\frac{1}{2}$	17 $\frac{1}{2}$	20	10 $\frac{1}{2}$	56	9 $\frac{1}{2}$	48 $\frac{1}{2}$	8	5 $\frac{1}{2}$	920	975
11	46 $\frac{1}{2}$	25 $\frac{1}{4}$	25	14 $\frac{1}{2}$	61 $\frac{1}{2}$	20 $\frac{1}{2}$	23 $\frac{1}{2}$	11 $\frac{1}{2}$	65 $\frac{1}{2}$	10 $\frac{1}{2}$	50 $\frac{1}{2}$	9	6 $\frac{1}{2}$	1300	1400
11 $\frac{1}{2}$	53	30	28	16 $\frac{1}{2}$	66	23	27	12	75 $\frac{1}{2}$	12 $\frac{1}{2}$	53	10	7	1700	1800

Nos. 1 to 6, inclusive, have but one pulley, Nos. 7 to 12 have two pulleys. Where so desired, we can make any of these sizes with two pulleys, to order.

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Buffalo Special Steel Pressure Blower,

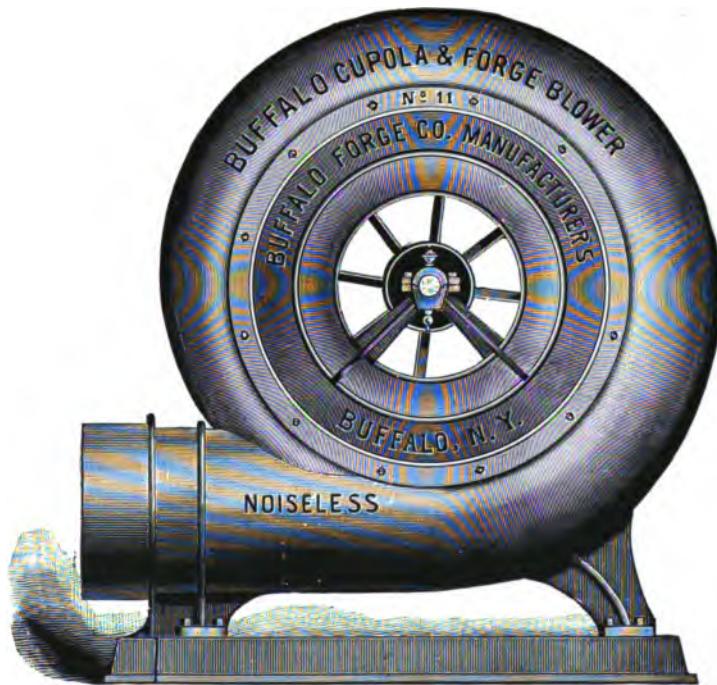
With Affixed Countershaft.



Shell of Blower and Countershaft Intact, Tight and Loose Pulleys.

Buffalo Steel Pressure Blower,

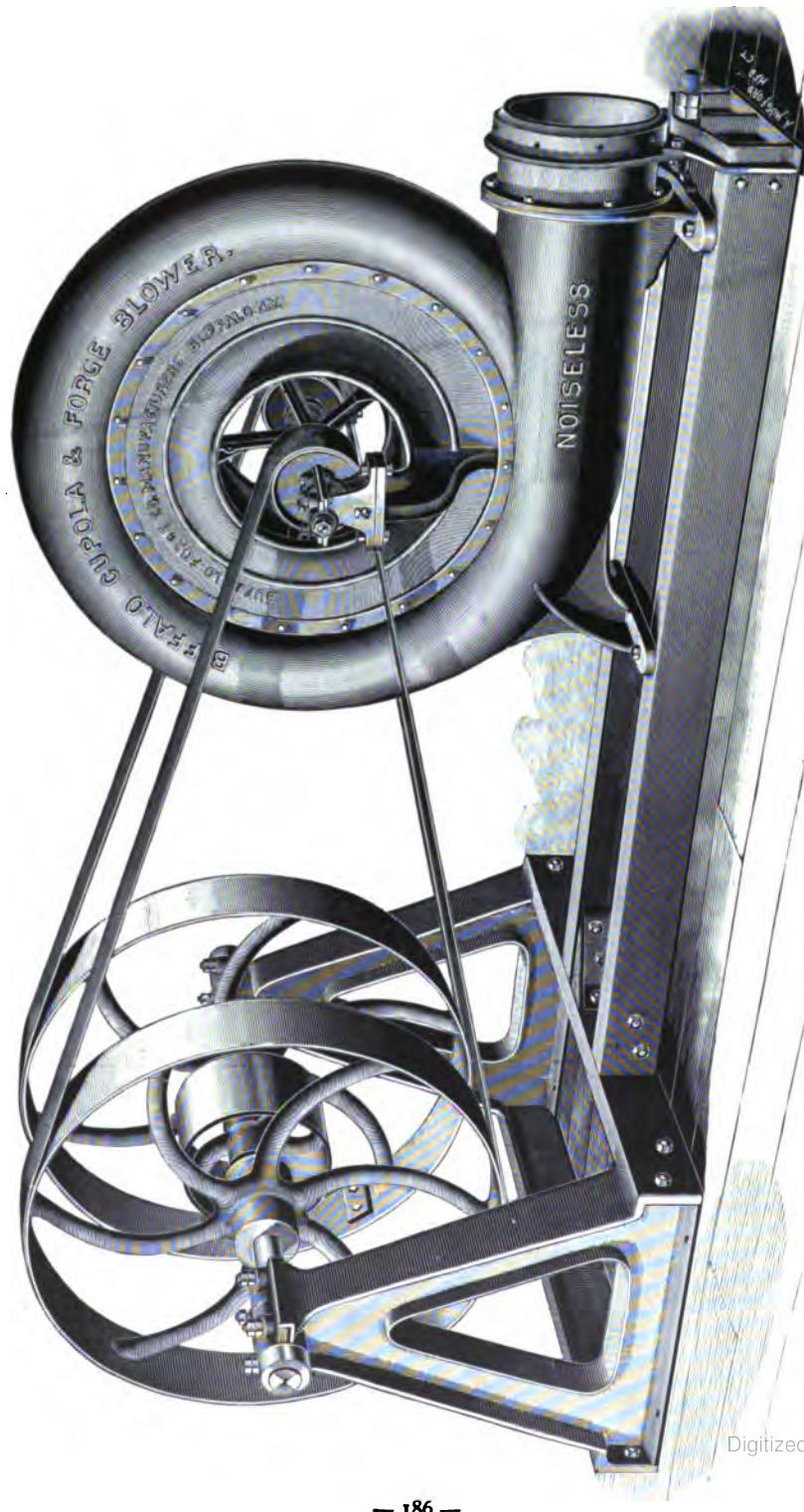
On Adjustable Bed, without Countershaft.



Provided with Adjusting Screw for Taking up Slack in Belts while
Blower is in Motion.

Buffalo Steel Pressure Blower,

On Adjustable Bed, Combined with Countershaft.



Engraved Direct from Photograph of Latest Improved Construction Form. Also Built with Tight and Loose Pulleys
on Countershaft, with Arm Extended at Right or Left.

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Buffalo Steel Pressure Blowers,

On Adjustable Bed, and on Adjustable Bed Combined with Countershaft.

UNLESS considerable care is taken in putting up countershafts, and some special attention is given to keep them in perfect alignment, trouble is often experienced, especially in keeping the belts on the larger sizes of blowers, on account of the great speed at which they have to run to produce high pressures. To overcome such features, this house designed the adjustable bed, and the adjustable bed combined with countershaft arrangements, which are illustrated on pages 185, 186 and 187, respectively. The blower on adjustable bed alone, without the countershaft, is very convenient for taking up the slack in belts while the fan is in motion and driven by belt from main line.

In the cut appearing on page 186 is shown the latest construction form of Buffalo Steel Pressure Blower on adjustable bed with combined countershaft. This arrangement is strongly recommended to our customers. Its use will be found to result in a decided saving in the wear and tear upon belts, which, in a short time, more than justifies the extra initial expense of the arrangement. The cost will be found little in excess of ordinary method, and a few turns of the nut on the end of the adjusting screw, which is clearly shown directly under the outlet of the blower, after first unloosening the holding-down bolts, which should afterward be re-tightened, accomplish, in a very few moments, what, previous to the introduction of this apparatus, has caused considerable delay and annoyance. It will readily be seen that the usual frequent re-lacing of belts, to make them sufficiently tight to avoid slipping, is hereby entirely obviated.

Positive alignment of the countershaft with the shaft of the blower by this arrangement causes the belt to track evenly, run smoothly and avoid the usual wear by their striking against the hanger or side of blower. As will readily be appreciated, the tightening screw gives the same uniform tension to both belts, and this may be regulated at will of operator. A telescopic mouth-piece, as is shown by the cut, is placed upon each blower purchased in this form, which enables the machine to be moved upon its bed without any disarrangement of the blast piping.

Especial attention is called to the fact that the arrangement of blower on adjustable bed combined with countershaft, as illustrated on page 186, occupies the smallest amount of space consumed by any apparatus of this kind manufactured in the world. Ordinarily tight and loose pulleys are placed upon the countershaft from which the power is transmitted to the countershaft of this apparatus. Where this feature is not desirable, which is often the case where power is transmitted from the main line without the intervention of a countershaft, the adjustable bed countershaft may be furnished with the blower, so that it will extend at the right or left, as desired, and the tight and loose pulleys are then placed thereon; we then have a right or left hand apparatus. The space between the two pulleys which drive the blower is not wide enough to permit of the introduction of tight and loose pulleys.

Channel iron is employed for the bed-plate, and each portion is securely bolted together, with the result of combining maximum stiffness and lightness. Buffalo oil ring bearings are used on the countershafts for the adjustable bed arrangements.

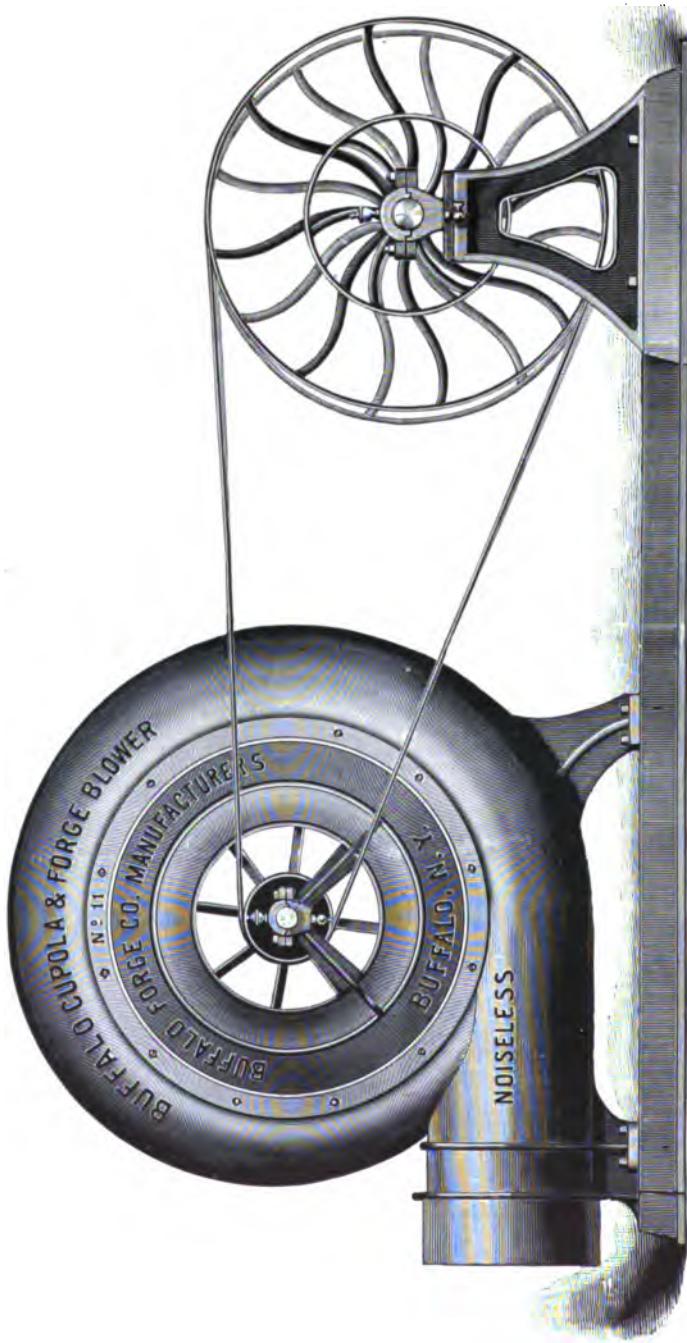
PRICE LIST OF BLOWER ON ADJUSTABLE BED, WITH AND WITHOUT COUNTERSHAFT.

NUMBER OF BLOWER	OUTSIDE DIAMETER OF OUTLET	DIAMETER OF PULLEY	FACE OF PULLEY	PRICE WITH BED BUT WITHOUT COUNTERSHAFT	PRICE WITH BED AND WITH COUNTERSHAFT
7	7 $\frac{1}{2}$	5	4 $\frac{1}{2}$	\$100.00	\$135.00
8	8 $\frac{1}{2}$	6	4 $\frac{1}{2}$	130.00	175.00
9	10 $\frac{1}{2}$	7	5	170.00	230.00
10	12 $\frac{1}{2}$	8	5 $\frac{1}{2}$	265.00	350.00
11	14 $\frac{1}{2}$	9	6 $\frac{1}{2}$	330.00	435.00
11 $\frac{1}{2}$	16 $\frac{1}{2}$	10	7	380.00	500.00
12	18	10	8	475.00	625.00

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Buffalo Steel Pressure Blower,

On Adjustable Bed, Combined with Countershhaft.



Construction Form Employed where Countershhaft Extends at Right or Left
to Receive Tight and Loose Pulleys.

Buffalo Steel Pressure Blowers,

On Adjustable Bed and Combined with Countershaft.

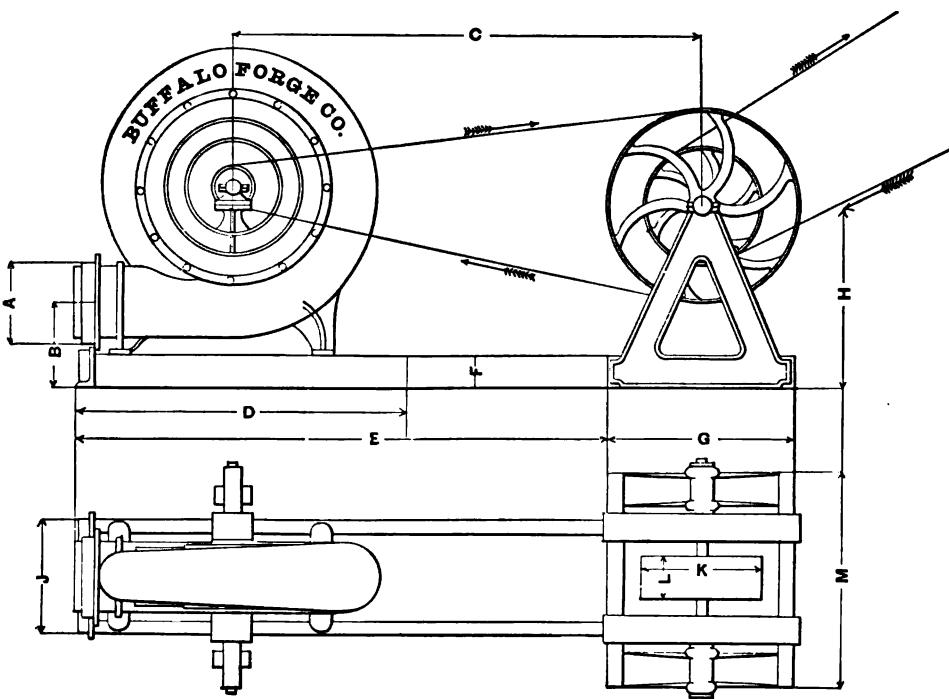


TABLE OF PRINCIPAL DIMENSIONS—IN INCHES.

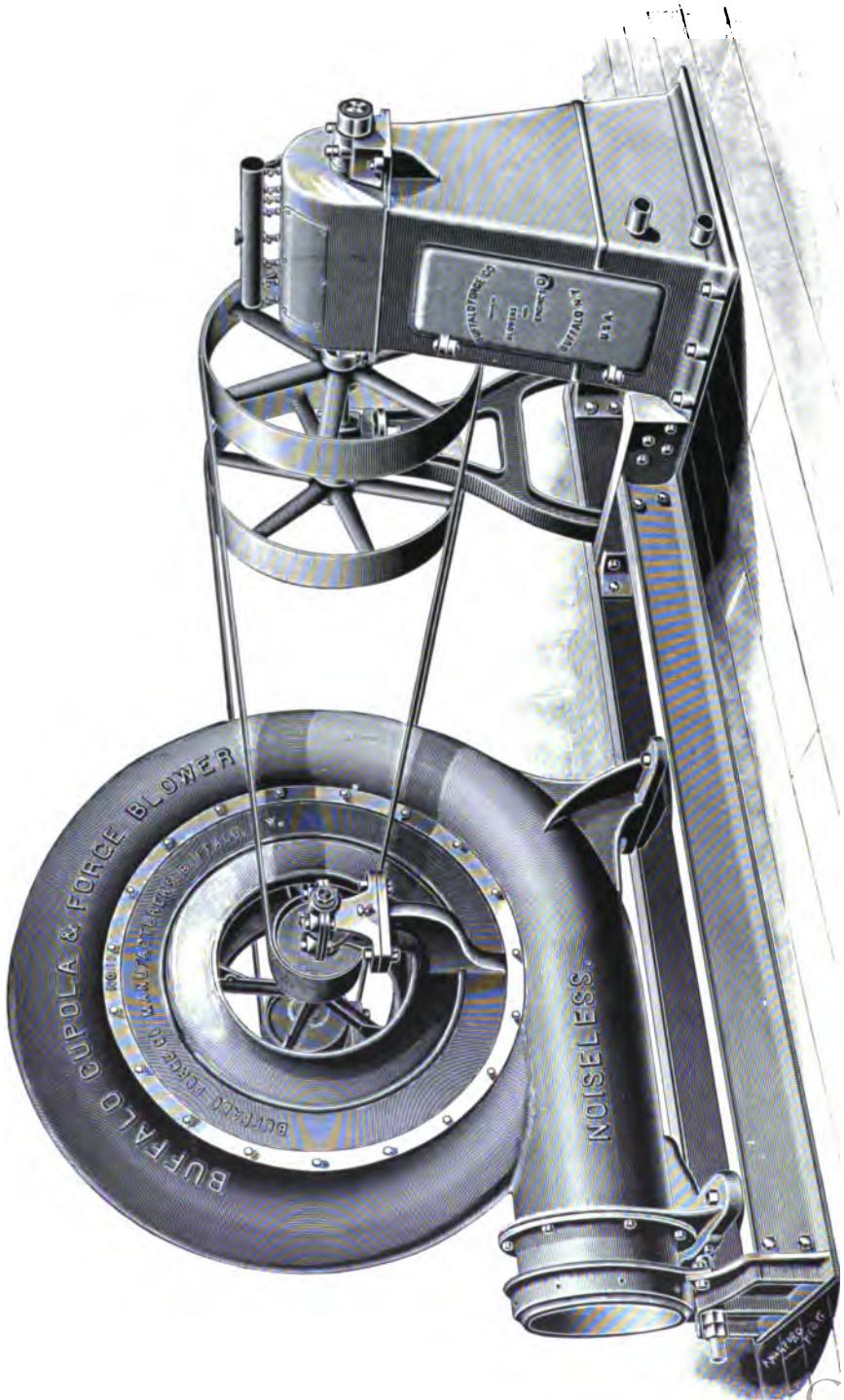
No.	A	B	C	D	E	F	G	H	J	K	L	M	WEIGHTS	
													Blower and Adjustable Bed	Blower, Bed and Countershaft
7	8½	12	66	34	74	4	24	24	19½	10	6	28	410	820
8	10	13½	70	39	78	4	24	24	21	12	6	30	550	1041
9	11	15	87	46	93	5	30	30	22	14	8	35	680	1594
10	13½	16	94	54	106	5	30	30	24	14	8	38	1040	2193
11	16½	18½	106	64	119	8	36	36	28	16	11	43	1565	3140
11½	18½	21	119	75	132	8	36	36	31½	18	14	48	2190	3200
12	19½	21	119	75	132	8	36	36	31½	18	14	49	2700	4600

“A” denotes outside diameter of telescopic outlet.

“D” denotes length of bed without countershaft.

Buffalo Steel Pressure Blower,

On Adjustable Bed, Combined with Upright Engine.



Double Enclosed Upright Engine, with Countershaft and Blower on same Bed Plate.

Right Hand Apparatus.

Buffalo Steel Pressure Blowers,

On Adjustable Bed, Combined with Double Upright Engine.

ON THE foregoing page, we have called attention to the special merits of the Buffalo Steel Pressure Blowers, as furnished in the adjustable bed form and also in the combination with countershaft.

The further combination as secured in the introduction of a Double Upright Enclosed Engine for supplying the power, affords the very highest economy and convenience. This arrangement gives positive control over the tension of belts, ensures the greatest rigidity, ease in adjustment, perfect alignment, and when it is desirable, an immediate change in the speed of the blower. The latter is a very desirable feature, especially in cupola work, because in hot weather it requires an increased volume of air to melt the same quantity of iron over that of cold weather. It will readily be seen that this arrangement possesses marked advantages over blowers with power by belt transmission, as they may be run whenever desired, and are independent of other sources of power.

The design of engine, together with the workmanship and material, employed is identically the same as upon the regular Buffalo Double Upright Enclosed Engines, which are described in full on page 13. This design of engine is peculiarly fitted for driving steel pressure or cupola blowers. In foundries or forge shops, much dust and dirt is present in the atmosphere, but the running parts of the engines are thoroughly protected therefrom. As will readily be seen by reference to the cut, this engine is furnished with a common oil chamber on top of frame, from which oil tubes of different sizes, according to the function each is to perform, lead to every reciprocating part. The same engine is also furnished with another oiling arrangement, such as illustrated by the engraving on page 9, where the engine is attached directly to a steel plate fan. Continuous running is possible without the repeated opening and closing of the door in engine. The engine, which is built in a variety of sizes for the different blowers, being especially designed and adapted for high rotative speed, possesses short stroke, and the reciprocating parts being perfectly balanced, render it unequaled by anything yet produced. All we ask is a thorough and honest investigation of the merits of this apparatus, which may be readily done, as a large number are in daily use in various sections.

Where a comparatively inexpensive arrangement is desired, and an engine with its working parts not wholly encased is not necessitated by the work to be accomplished, the Buffalo Single Upright Enclosed Self-contained Engine, described on page 49, is furnished and combined with a countershaft on the same bed-plate, and renders efficient service, unless extremely high pressures of air are wanted; in the latter case, the double engines are invariably employed. Where a small blower is required with power independent from other source, this type of engine is especially suited for the requirements.

In ordering, a complete description of the work to be performed should be given, and if the blower is not to be used for cupola duty, the pressure of air required should be stated, and a sketch forwarded showing the course of the conveying piping.

PRICE LIST, SIZES AND DIMENSIONS.

NO. OF BLOWER	HEIGHT IN INCHES	OUTSIDE DIAM. OF OUTLET	DIAM. OF CYLINDERS	STROKE	WEIGHT OF COM- PLETTE APPARATUS	PRICE
7	35	7 $\frac{1}{2}$	3	4 $\frac{1}{2}$	1220	
8	40	8 $\frac{1}{2}$	3 $\frac{1}{2}$	4 $\frac{1}{2}$	1640	
9	45	10 $\frac{1}{2}$	4	4 $\frac{1}{2}$	2294	
10	56	12 $\frac{1}{2}$	5	7	3540	
11	66	16 $\frac{1}{2}$	5 $\frac{1}{2}$	7	4780	
11 $\frac{1}{2}$	76	18	6	7	5700	
12	80	20	6 $\frac{1}{2}$	7	6800	

Buffalo Steel Pressure Blowers,

On Adjustable Bed, Combined with Double Upright Engine.

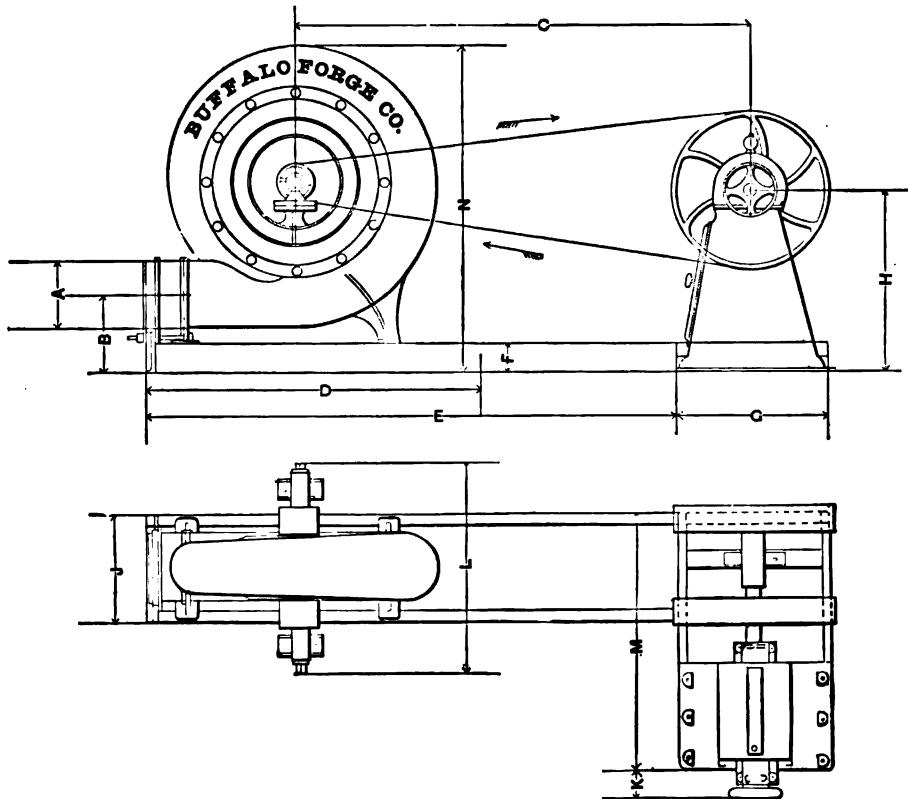
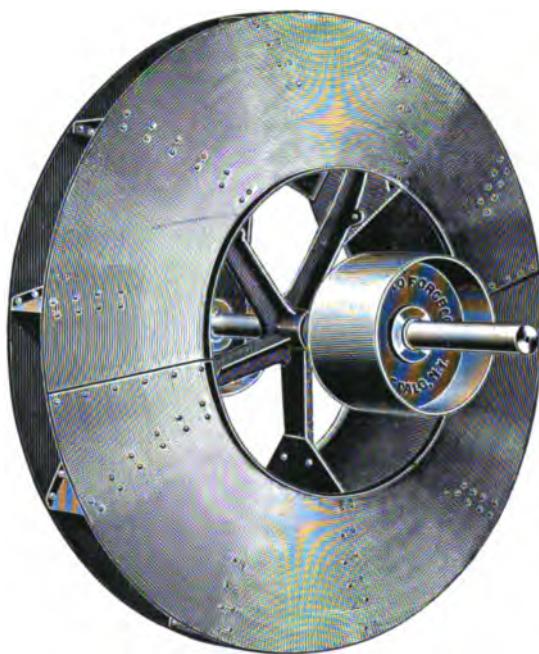


TABLE OF PRINCIPAL DIMENSIONS—IN INCHES.

No.	A	B	C	D	E	F	G	H	J	K	L	M	N	WEIGHT
7 3 x 4½	8½	12	66	34	74	4	24	35	19½	5½	38	39	39	1220
8 3½ x 4½	10	13½	70	39	78	4	24	35	21	5½	41	42	43	1640
9 4 x 4½	11	15	87	46	93	5	30	35	22	5½	44	44	49	2294
10 5 x 7	13½	16	94	54	106	5	40	46½	24	7½	51½	59	62	3540
11 5½ x 7	16½	18½	106	64	119	8	40	46½	28	7½	53½	63	74	4780
11½ 6 x 7	18½	21	119	75	132	8	40	46½	31½	7½	55	66	84	5700
12 6½ x 7	19½	21	119	75	132	8	40	46½	31½	7½	55	67	84	6800

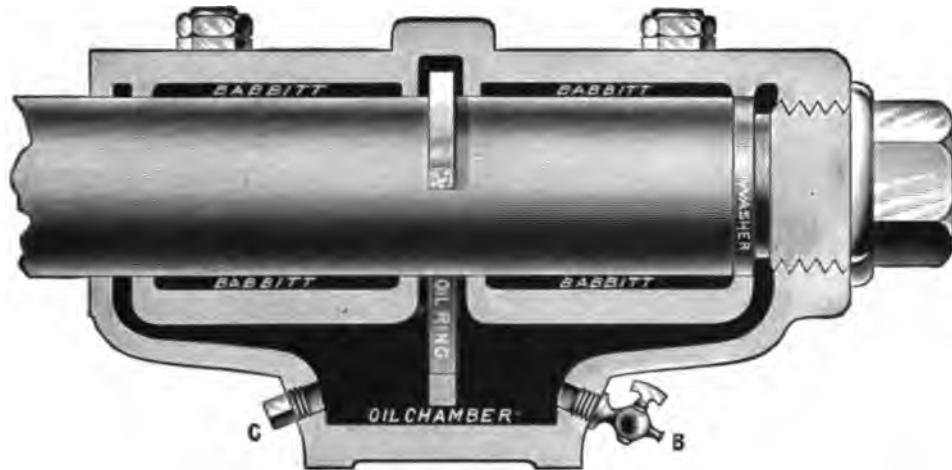
"A" denotes outside diameter of telescopic outlet. "B" denotes length of bed without countershaft.
Also built as a left-hand apparatus, with engine on opposite side of the blower.

Buffalo Steel Pressure Blower Blast Wheel,
With Accompanying Shaft and Pulleys

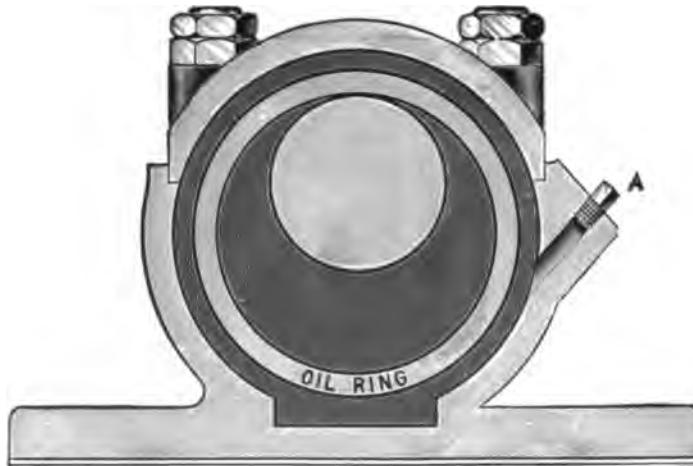


Engraved Direct From Photograph.

Buffalo Steel Pressure Blower Journal Bearings,
Oil Ring Type.



Sectional View, Fig. 1.



End View, Fig. 2.

Buffalo Steel Pressure Blowers,

For Cupola Furnaces and Forge Fires.

BLAST WHEELS.—On page 193 we illustrate the form of blast wheel, with its accompanying shaft and pulleys, that is employed for Buffalo Steel Pressure Blowers, the engraving being made direct from a photograph. In the construction of these wheels, the highest degree of mechanical skill and nicety is called into play. They are made of the best composition bronze and homogeneous patented leveled steel, rolled thin, but always to a standard, and especially for us. The process in use at our works for securing an accurate balance has been adopted after years of experiments, and is the only system whereby we have found it is possible to bring the center of gravity in a rapidly rotating body, to exactly coincide with its mechanical center. The result obtained is as nearly as possible a theoretically perfect balance. Every wheel is tested thoroughly before leaving the works, and made to run smoothly without appreciable vibration, at 25 per cent. higher speed than required in actual use. The making of these wheels involves the greatest care and fineness of anything about the steel pressure blowers. The fact that we have so systematized their construction as to render it unnecessary to employ numerous patch pieces or weights in securing a perfect metalline counterpoise, which is commonly done by other manufacturers, clearly indicates that the entire construction and design of these machines has been brought to a fine point. When ordering new blast wheels or repairs, observe instructions on page 157.

BUFFALO PATENTED OIL RING BEARINGS.—A number of years ago, this house designed and patented the oil ring journal bearings, illustrated by cuts on page 194. They were first used on the steel pressure blowers, which always run at a very high speed, and proving so eminently suited for this service they have been adopted with slight variation on all blowers and exhausters of our manufacture. The cut on page 194 also illustrates the bearing employed for Buffalo "B" Volume Blowers and Exhaust Fans.

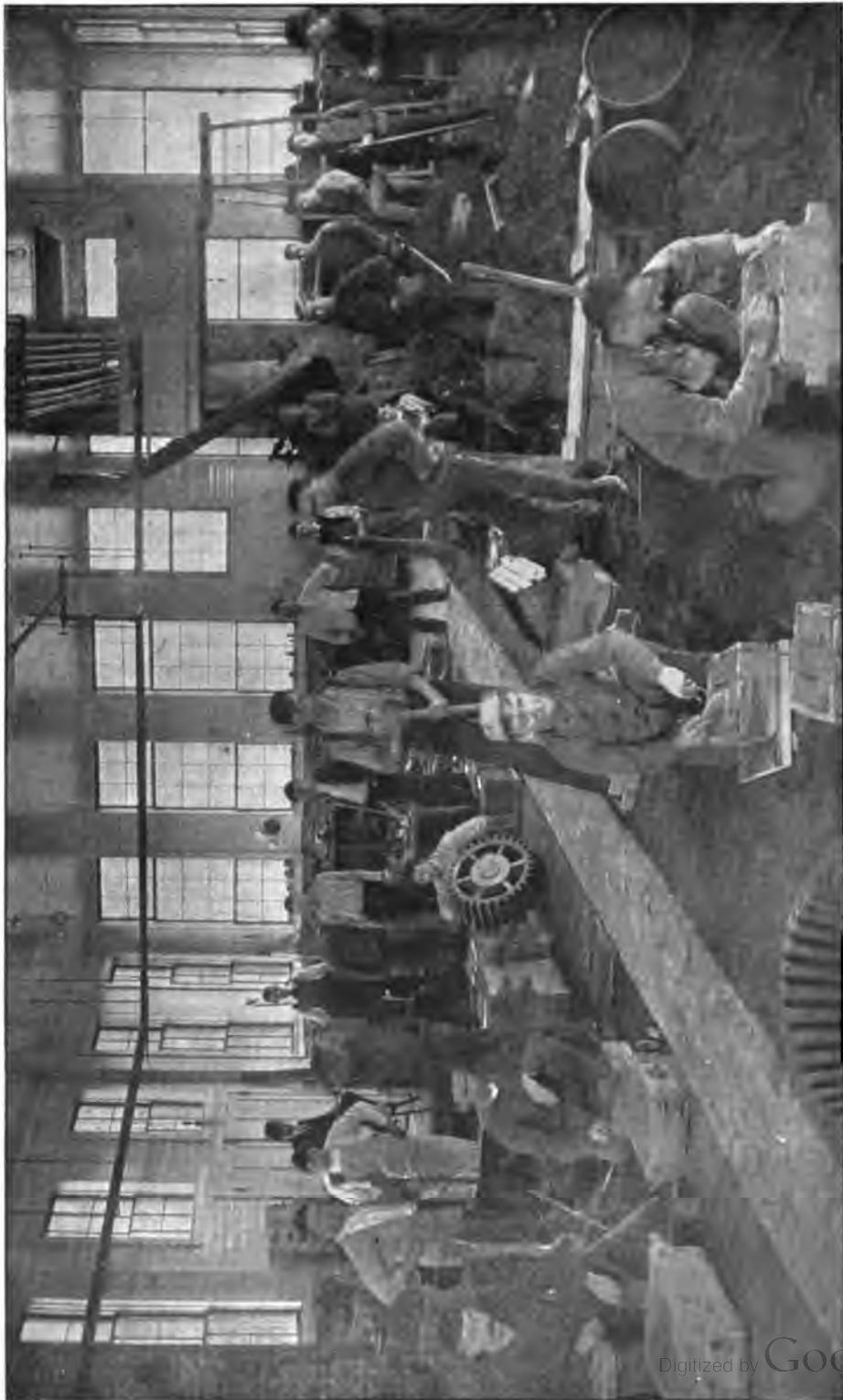
Referring to Fig. 1, it will be seen that the lower half of the bearing has an oil chamber through which the oil ring passes. The oil ring revolves when the shaft is in motion, and conveys the oil from this chamber to the shaft, from which it is distributed by means of chamfered edges the full length of the bearing. The surplus oil then passes to the recesses at the end of the bearing, where it is then returned by means of the channels to the oil chamber. By this method a positive feed is obtained, and the oil supply being regulated by the speed of the shaft, it is impossible for the bearing to heat while there is oil in the chamber. Another feature of this bearing is that a peculiar rattling of the ring occurs when the oil is nearly consumed; this gives the warning before the bearing is actually suffering from lack of oil, for it will run for quite a time after this rattling begins, without injury. No oil cup is necessary, as one filling of chamber will do from two weeks to two months, depending upon the speed and number of hours the blower is run each day.

OILING AND CLEANING.—To fill oil chamber, remove plug "A"; after filling, replace. When good oil is used, ordinarily it will not be necessary to renew oftener than once a month. No other attention is required, as the ring carries the oil to bearing as long as any remains in the chamber. By the bibb cock "B," the oil may readily be removed from the chamber, should it become thick by continuous use or dirt. After this is taken out, the bibb cock should be closed and the chamber filled with a strong solution of sal soda, allowing it to remain for an hour; then remove plug "C," open up bibb cock and rinse thoroughly with hot water through plug "A." Replace plug "C," close bibb cock and refill the bearing. A cleaning of this nature is seldom required when a good quality of oil is used.

BUFFALO STEEL PRESSURE BLOWERS IN TRAINING SCHOOLS.—On page 196 appears a handsome half-tone engraving showing the interior of one of the foremost Manual Training Schools in America. Buffalo Steel Pressure Blowers are used in a large number of institutions of this kind for supplying blast to cupolas, and also for supplying the forge fires. On pages 100 to 102 and 218 to 221 of this catalogue, further reference is made to this subject, which cannot be embodied in the limited space here at command.

Buffalo Steel Pressure Blowers,

For Cupola Furnaces and Forge Fires.



Foundry Department of a Prominent Manual Training School.

Buffalo Steel Pressure Blowers,

For Cupola Furnaces in Iron Foundries.

IN THE following table we have given two different speeds and pressures for each size blower, and the quantity of iron that may be melted per hour with each. In all cases, we recommend using the lowest pressure of blast that will do a given work. Run up to the speed given for that pressure, and regulate quantity of air by the blast gate. The proportion of tuyerage should be at least one-ninth of the area of cupola, in square inches, with not less than four tuyeres at equal distances around cupola, so as to equalize the blast throughout. With tuyeres of one-twentieth of area of cupola, it will require double the power to melt the same quantity of iron, and the blast will not be so evenly distributed. Variations in temperature affect the working of cupolas very materially. Hot weather requires an increase in volume of air to melt same quantity of iron as in cold weather. We recommend, where it is practical, the use of an independent or a Buffalo Double Upright Engine to run the blower, as in the combination apparatus illustrated on page 190, for then the speed of engine can be so varied as to meet all changes in conditions and quantity of iron to be melted.

For table showing necessary increase in diameter for different lengths of blast pipes, see page 148, and table for equalizing diameter of pipes page 151. The table exhibiting horse-power and pressure required to overcome friction of air passing through pipes, and indicating necessary increased speed of blower, appears on pages 152 to 155, inclusive.

TABLE OF SPEEDS AND CAPACITIES AS APPLIED TO CUPOLAS.

NUMBER OF BLOWER	SQUARE INCHES BLAST	DIAMETER INSIDE OF CUPOLA, IN INCHES	PRESSURE IN OUNCEs	SPEED—NO. OF REV. PER MINUTE.		MELTING CAPACITY IN LBS. PER HOUR	CUBIC FEET OF AIR REQUIRED PER MINUTE	PRESSURE IN OUNCEs	SPEED—NO. OF REV. PER MINUTE		MELTING CAPACITY IN LBS. PER HOUR	CUBIC FEET OF AIR REQUIRED PER MINUTE
				MELTING CAPACITY IN LBS. PER HOUR	CUBIC FEET OF AIR REQUIRED PER MINUTE				MELTING CAPACITY IN LBS. PER HOUR	CUBIC FEET OF AIR REQUIRED PER MINUTE		
4	4	20	8	4732	1545	666	9	5030	1647	717		
5	6	25	8	4209	2321	773	10	4726	2600	867		
6	8	30	8	3860	3093	951	10	4108	3671	1067		
7	14	35	8	3244	4218	1486	10	3642	4777	1668		
8	18	40	8	2948	5425	2199	10	3310	6082	2469		
9	26	45	10	2785	7818	3203	12	3260	8598	3523		
10	36	55	10	2195	11295	4938	12	2413	12378	5431		
11	45	65	12	1952	16955	7707	14	2116	18357	8358		
11½	55	72	12	1647	22607	10276	14	1797	25176	11144		
12	75	84	12	1647	25836	11744	14	1797	28019	12736		

Buffalo Steel Pressure Blowers,

Application to Forge Fires.

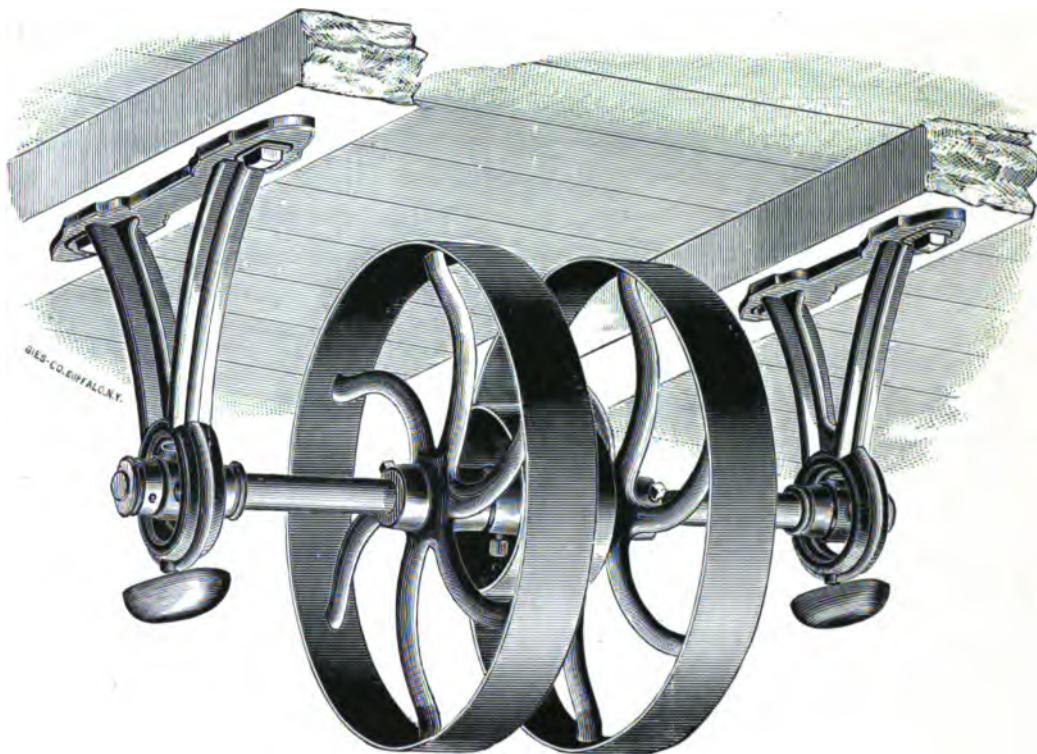
THE proper dimensions of blast pipes are essential if the maximum efficiency of any blower is to be secured. Blast gates should be employed at each forge for regulating the amount of air delivered, and for entirely closing off the blast when not needed. Where Buffalo Stationary Forges are employed, the purchase of separate blast gates is not necessitated, as a blast gate is attached to and furnished with each machine. All elbows and bends in the main or branch pipes should be made upon easy curves, and the branches should enter the main pipe in the direction of the blower. Piping drawings are furnished, wherever desired, with every Buffalo Steel Pressure Blower sold, provided a detailed sketch of the premises in which the machine is to operate is supplied.

For table showing necessary increase in diameter for different lengths of blast pipes, see page 148, and table for equalizing diameter of pipes, page 151. The table exhibiting horse-power and pressure required to overcome friction of air passing through pipes, and indicating necessary increased speed of blower, appears on pages 152 to 155, inclusive.

TABLE OF SPEEDS AND CAPACITIES AS APPLIED TO FORCE FIRES.

NO. OF BLOWER	NO. OF FORGES ORDINARY SIZE	4-OUNCE PRESSURE		5-OUNCE PRESSURE		6-OUNCE PRESSURE		7-OUNCE PRESSURE	
		Speed —No. of Revolu- tions per Minute	Cubic Feet of Air per Minute						
2	4	4825	336.	5405	369.6	5933	403.2	6422	436.8
3	5	3977	493.5	4456	522.85	4892	592.2	5256	641.55
4	6	3318	560	3718	616	4081	672	4417	728
5	7	2952	686	3317	754.8	3630	823.2	3929	891.8
6	9	2556	831.25	2864	914.37	3156	997.5	3170	1074.6
7	13	2275	1252.3	2547	1377.5	2798	1502.7	3028	1627.9
8	18	2067	1559.45	2118	1747.2	2543	1897.8	2752	2075.7
9	26	1850	2013.14	2073	2255.6	2276	2476.8	2464	2869.6
10	38	1371	3096.3	1668	3469.3	1686	3808.1	1825	4121.6
11	60	1108	4168	1240	4670	1363	5126	1500	5548
11½	92	960	5835	1051	6538	1160	7176	1250	7768
12	98	900	6870	1000	7705	1100	8457	1200	8878

Buffalo Improved Countershafts,
Especially Designed for Buffalo Blowers and Exhausters.



Furnished with Tight and Loose Pulleys, or with Single
Driving Pulley, as Required.

Buffalo Improved Countershafts,

For Steel Pressure Blowers.

ON THE opposite page we illustrate the Improved Buffalo Countershafts, which are especially designed for driving Buffalo Steel Pressure Blowers. Steel shafts are employed, and accurately turned to a given size. The diameters vary according to the duty of the countershaft, as will be observed, and the pulleys are also properly proportioned for the strain necessitated in driving the various sizes of Buffalo Steel Pressure Blowers. All portions of the countershaft are made of the best material. It will be noticed that the pulley from which the countershaft receives its motion from the main line, is located between the two large pulleys which drive the blower, unless the countershaft is ordered with tight and loose pulleys; then both are located either on the right or left side of the blower driving pulleys, as there is not sufficient room between for the extra pulley. By arranging the pulleys in this manner, which is also employed for the Buffalo Steel Pressure Blowers on adjustable bed with combined countershaft, a minimum amount of space is consumed, and advantage is derived from supplying the power in the most direct manner. The pulleys on these countershafts are as light as is consistent with ample strength, are carefully balanced, and the boxes are well babbitted and have the usual attachment of large oiling drips.

The detailed dimensions of Buffalo regular countershafts for steel pressure blowers may be secured by reference to the cut and table on page 201. These countershafts are especially adapted for any service, and, being sold at a nominal figure, they are widely used for transmitting power from the main line to various machines other than blowers and exhausters.

In ordering or making inquiry as to cost, always mention the speed of main line of shafting and the largest pulley which can be used thereon. In nearly all cases, it is always desirable to get as much speed as possible from the main line shafting and to use as large a pulley as possible on the countershaft for main belt. Tight and loose pulleys may be furnished on these countershafts at a small additional price, where desired.

PRICE LIST, SIZES AND DIMENSIONS.

NUMBER OF STEEL PRES- URE BLOWER	DIAMETER OF PUL- LEY DRIVING BLOWER	DIAM. OF PULLEY DRIVEN BY MAIN BELT FROM LINE SHAFT	DIAMETER OF SHAFT	PRICE WITH ONE DRIVING PULLEY	PRICE WITH TWO DRIVING PULLEYS
1	12	4	$\frac{7}{8}$	\$ 8.00	
2	14	5	1	10.00	
3	16	6	$1\frac{1}{4}$	12.00	
4	18	7	$1\frac{1}{4}$	16.00	
5	21	8	$1\frac{1}{8}$	20.00	
6	26	9	$1\frac{1}{8}$	25.00	
7	30	10	$1\frac{1}{4}$	30.00	\$ 35.00
8	32	12	$1\frac{1}{4}$	40.00	45.00
9	36	14	$2\frac{1}{4}$	50.00	60.00
10	40	16	$2\frac{7}{8}$	70.00	80.00
11	42	17	$2\frac{1}{4}$	80.00	90.00
$11\frac{1}{2}$	44	18	3	90.00	100.00
12	44	18	3	100.00	110.00

Buffalo Improved Countershafts,

For Steel Pressure Blowers.

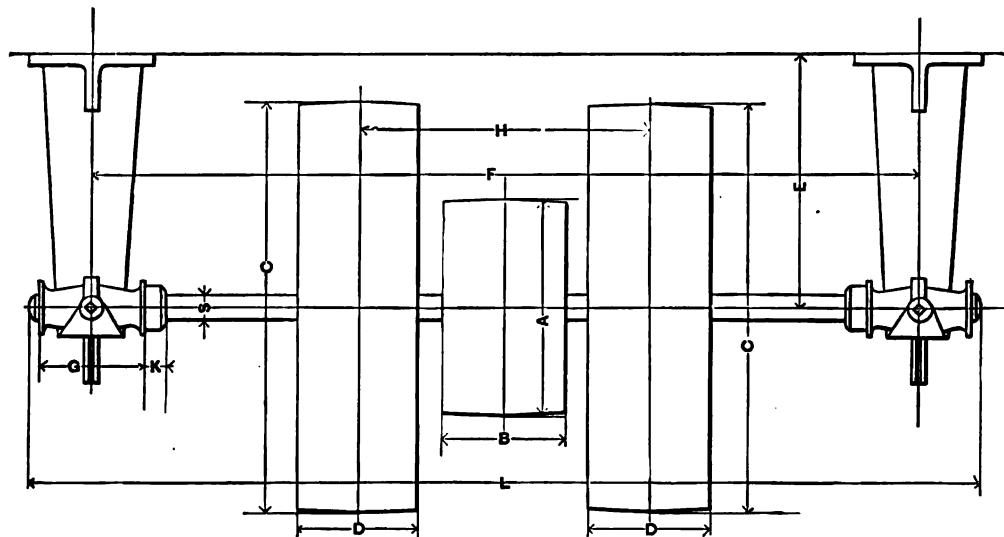


TABLE OF PRINCIPAL DIMENSIONS—IN INCHES.

NO. OF COUNTER-SHAFT	S	L	A	B	C	D	E	F	G	H	K	NO. OF STEEL PRESSURE BLOWER
1	$\frac{7}{8}$	$19\frac{1}{4}$	4	3	12	$1\frac{1}{4}$	$6\frac{7}{8}$	$15\frac{1}{2}$	4		$\frac{7}{8}$	1
2	1	$21\frac{1}{2}$	5	$3\frac{1}{2}$	14	$2\frac{1}{4}$	$8\frac{1}{2}$	$17\frac{1}{2}$	4		1	2
3	$1\frac{1}{2}$	$23\frac{1}{2}$	6	4	16	$2\frac{5}{8}$	$9\frac{1}{2}$	$18\frac{1}{2}$	4		$1\frac{1}{2}$	3
4	$1\frac{1}{4}$	$26\frac{1}{4}$	7	$4\frac{1}{2}$	18	3	$9\frac{1}{2}$	$21\frac{1}{2}$	$4\frac{1}{2}$		$1\frac{1}{2}$	4
5	$1\frac{3}{8}$	$27\frac{1}{4}$	8	$4\frac{1}{2}$	21	3	$10\frac{1}{4}$	$22\frac{1}{2}$	5		$1\frac{3}{8}$	5
6	$1\frac{1}{8}$	31	9	5	26	$3\frac{1}{2}$	$12\frac{1}{2}$	$25\frac{1}{2}$	$5\frac{1}{2}$		2	6
7	$1\frac{1}{4}$	$39\frac{1}{2}$	10	$5\frac{1}{2}$	30	$4\frac{1}{2}$	$15\frac{1}{2}$	$33\frac{1}{2}$	6	$13\frac{1}{2}$	$2\frac{1}{4}$	7
8	$1\frac{1}{8}$	44	12	6	32	$4\frac{1}{2}$	$16\frac{1}{2}$	$37\frac{1}{2}$	$6\frac{1}{2}$	$15\frac{1}{2}$	$2\frac{1}{2}$	8
9	$2\frac{1}{4}$	$48\frac{1}{2}$	14	6	36	5	$18\frac{1}{2}$	$41\frac{1}{2}$	7	$16\frac{1}{2}$	$2\frac{3}{4}$	9
10	$2\frac{7}{8}$	$52\frac{1}{2}$	16	8	40	$5\frac{1}{4}$	$20\frac{1}{2}$	$44\frac{1}{2}$	$7\frac{1}{2}$	19	3	10
11	$2\frac{1}{4}$	62	17	10	42	$6\frac{1}{2}$	$23\frac{1}{2}$	51	9	$22\frac{1}{2}$	3	11
11 $\frac{1}{2}$	3	$73\frac{1}{2}$	18	12	44	7	$23\frac{1}{2}$	64	9	$24\frac{1}{2}$	$3\frac{1}{2}$	$11\frac{1}{2}$
12	3	$76\frac{1}{2}$	18	12	44	8	$23\frac{1}{2}$	67	9	$24\frac{1}{2}$	$3\frac{1}{2}$	12

Nos. 1 to 6, inclusive, have but one pulley; Nos. 7 to 12 have two pulleys.

Buffalo Improved Blast Gates,
For Opening and Closing Blast Pipes.



Slide Pattern, Cast Iron Shell. Slide of Heavy Steel Plate.

Buffalo Improved Blast Gates,

Slide Pattern.

THESE devices are especially designed for opening and closing blast pipes, such as employed for conveying air between Buffalo Steel Pressure Blowers to cupolas, to forges and furnaces, etc., for use in shavings exhaust, smoke exhaust and emery exhaust piping systems, and, in short, for all situations where material of any kind is handled by an exhaust fan through tubes or piping layouts. Blast gates are also employed in conjunction with the Buffalo Hot Blast System of Heating and Ventilating, for regulating the amount of air delivered to certain branch pipes, or for closing it off altogether, as desired.

The lever pattern of blast gates may be also supplied at the same figure as the regular slide pattern given in the following table, but is not so convenient or desirable. The size indicates outside diameter of the collar of the gate where the pipes slide on. Sizes from two to six inches, inclusive, are made exactly as shown in cut. From eight inches and upwards, they are made in two portions and bolted together with the slide in between.

CUPOLAS.—It is very important that a blast gate be located in the main pipe leading to the cupola, in order to regulate and control the blast. The gate is also a safeguard against gas explosions, which often occur from the accumulation of gas during the temporary stoppage of the blower. The gate should always be closed before stopping the blower, and not opened until it is again started up.

FORGES AND FURNACES.—A blast gate should be provided and used at each forge and furnace, not only as a safeguard, but for regulating the amount of blast supplied to each. The employment of the gate places this under positive control of operator, which feature is important. Piping in forge exhaust outfit should be of extra heavy gauge.

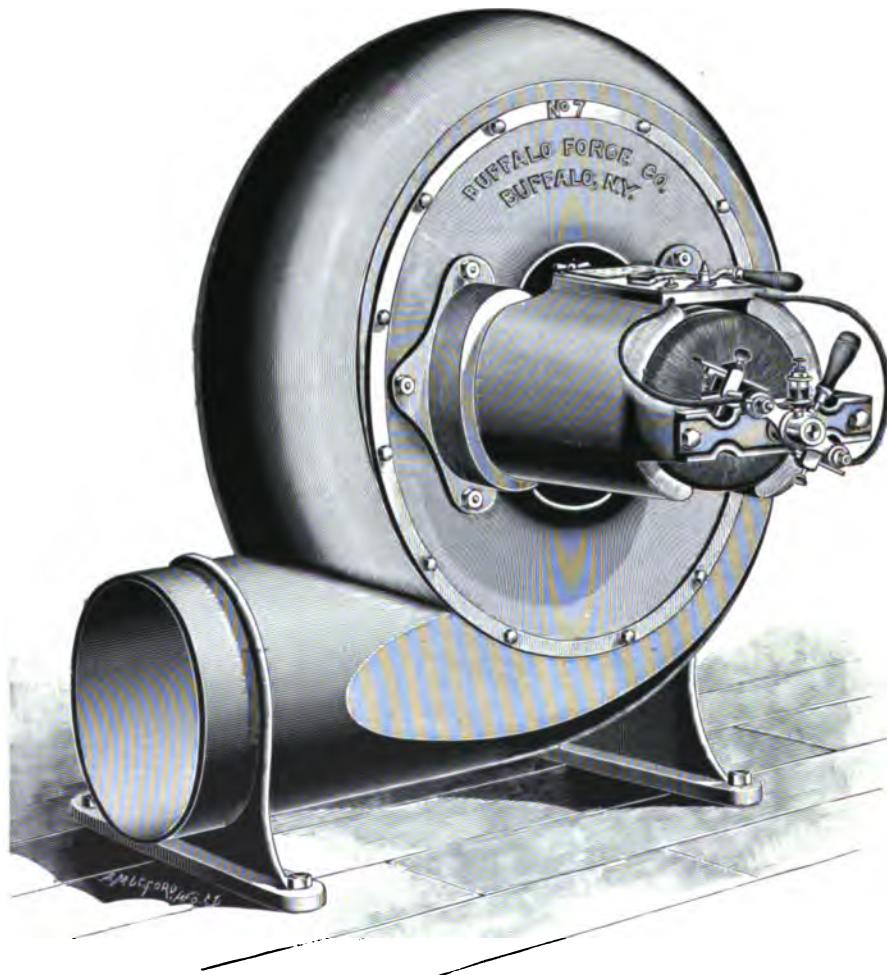
EXHAUST OUTFITS.—Whether for removing smoke, for handling shavings, emery dust, or any similar refuse material, in any exhaust outfit, a gate should be provided at every opening so that when not in use they may be closed. In many planing mill exhaust outfits, a fan is not selected which has sufficient capacity to handle the refuse from all the wood-working machinery in the event of their running at the same time; therefore, by closing off the branches which are not in use, the draft to other pipes increases. It is not always necessary to estimate an exhauster large enough to care for all of the machinery when running at the same time, but when this is not done, the use of a blast gate is imperative. Especial attention is directed to the fact that the use of these gates, to close such pipes as are not in continual use, ensures great economy in power, for a blower or exhauster consumes much less power in running when it is not handling more air than is actually required to accomplish a given service.

PRICE LIST WITH SIZES.

SIZE	MATERIAL	PRICE	SIZE	MATERIAL	PRICE
2 inch	Cast iron with steel slide	\$1.00	10 inch	Cast iron with steel slide	\$ 5.00
2½ "	" " " " "	1.25	12 "	" " " " "	6.50
3 "	" " " " "	1.50	14 "	" " " " "	8.00
4 "	" " " " "	2.00	16 "	" " " " "	12.00
5 "	" " " " "	2.25	18 "	" " " " "	16.00
6 "	" " " " "	2.50	20 "	" " " " "	18.00
8 "	" " " " "	3.50	24 "	" " " " "	21.00

Buffalo Electric Blowers,

Built in the "B" Volume and Steel Pressure Types.



"B" Volume Electric Blower, Right Hand Bottom
Horizontal Discharge.

Buffalo Electric Blowers,

Built in "B" and Steel Pressure Types.

ELECTRICITY now being so largely in use as a motive power, and continually gaining in popularity, a wide field for the introduction of the Buffalo Electric Blowers and Exhausters is thereby afforded.

The "B" Volume Blowers and Exhausters, illustrated on the following pages, are both built with electric motors of approved type as a part of the fan, and connected directly to the fan shaft. Electric fans afford greater convenience even than direct attached engine fans. They are unrivaled in their adaptability to all classes of work, and to all locations. To start and stop is simply a matter of moving a switch or pushing a button, according to the arrangement. No engines or belts are required, and they are always ready for immediate use.

One special feature of their great convenience, to which particular attention should be called, is the fact that the fans can be set up in any position without affecting the running of the motor. This so adapts the fans that they may be located to discharge or exhaust from any desired direction, which entails the least complication of pipe connections. The "B" Volume type of Blower and Exhauster, when built as an electric fan, can readily be furnished in the different styles of discharges described for this design.

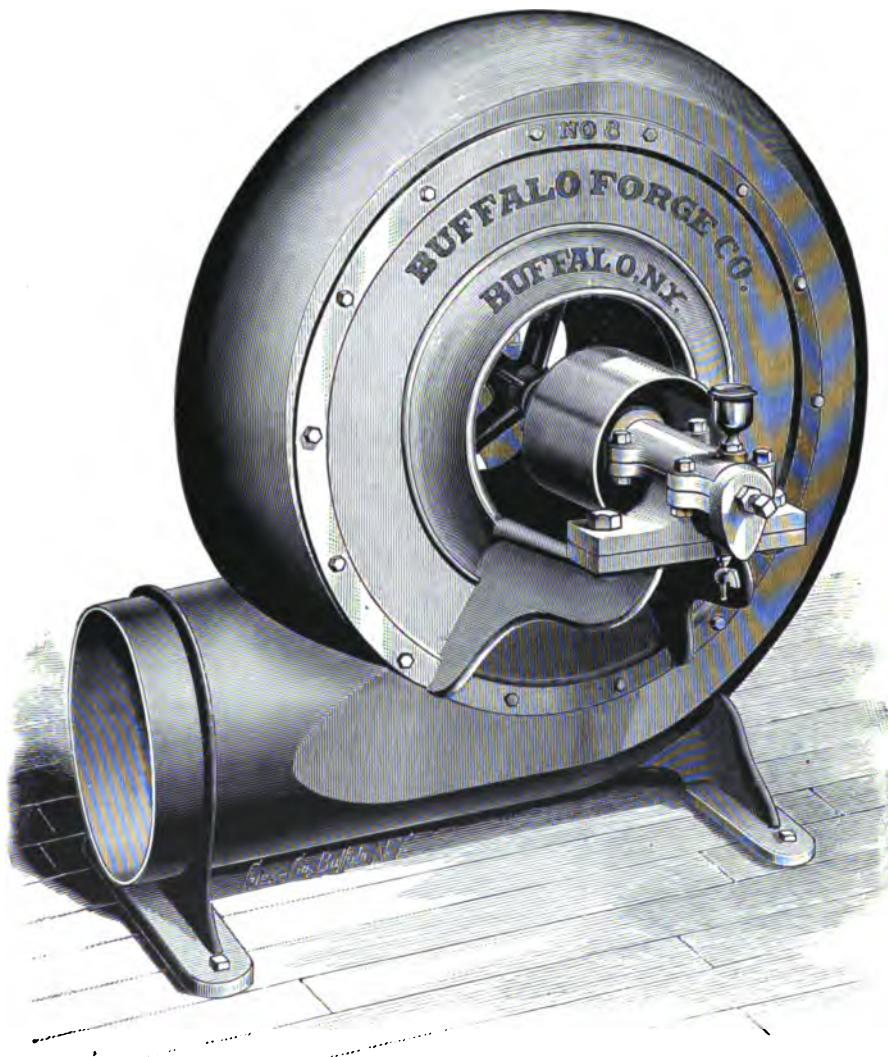
Not only is there rapid growth in the individual demands for electric power furnished in large cities by a central power plant, but private manufacturing enterprises are fast appreciating its convenience. There is, therefore, a growing demand for Buffalo Electric Blowers and Exhausters from this source as well. All types of fans built by this house can be readily fitted and furnished with direct attached electric motors, though, in the case of very large steel plate fans, it is usually more desirable to employ an independent motor, conveniently located, and then belt to the fan. All the fans supplied are of standard high grade, but are somewhat especially designed to receive the motors. That the highest efficiency may be secured, electric motors of approved design and special construction are built for the propulsion of the different varieties of fans. They are also capable of continuous use with only ordinary attention. For ventilating work, these fans have found wide favor, and may be employed in a multitude of positions where the introduction of an engine and boiler required to derive the power for driving other varieties of fans would be impossible. All that is required is a wire connection with a power circuit, and the fan is ready for immediate operation. Electric fans may be driven at a high speed, therefore they are of large capacity. The combination of electric motor and fan, with proper care and under ordinary conditions of use, is noiseless in operation and is the acme of convenience.

Buffalo Steel Pressure Blowers are very frequently furnished with electric motors attached direct to the shaft. It is frequently desirable, especially in the larger sizes, to arrange the combination of steel pressure blower and motor substantially as shown on page 190, substituting the motor for the engine. By properly proportioning the pulleys on countershafts, any pressure required for ordinary duty can be given while the motor is making its regular speed. Where a Buffalo Electric Steel Pressure Blower with motor attached direct to the blast wheel shaft is wanted for high speeds, the motor is invariably built to order.

For blowing church organs, the Buffalo Electric Fans combine convenience and efficiency in the highest degree. The unreliability of water motors, due not only to the variations of water pressure, but to their tendency to be continually out of order, is entirely done away with. It is not frequent that steam power is available in a church, and even in this event, the Electric Organ Blowers are so far in advance of this manner of propulsion as to afford no room for comparison. The operation of the machine is under positive and most complete control of the organist. In making inquiries or asking for prices, a complete description of the desired work to be accomplished should be furnished. If an Electric Steel Pressure Blower is wanted for cupolas or forge fires, the diameter and name of maker of the former should be given, together with the distance the blower will set from the cupola, and if for the latter, the number of fires should be mentioned, as well as the relative position of the blower thereto. A drawing to scale of the entire layout is the best manner of presenting this data. The voltage of the current under which this machine is to operate, invariably should be mentioned. In ordering organ blowers, state the number of manuals, name of maker of organ, size of bellows and number of stops.

Buffalo "B" Volume Blower,

For Boilers, Heating Furnaces and Forges.



Bottom Horizontal Discharge, Right Hand.

Buffalo "B" Volume Blower,

For Boilers, Heating Furnaces and Forges.

THIS type of blower is especially adapted for all purposes requiring a large volume of air at quite a heavy pressure. The Buffalo "B" Volume Blowers have found great use in the capacity of blowing of forge fires, puddling furnaces, heating furnaces and supplying draft to steam boilers. In the South, in sugar refineries, hundreds of these machines are used in conjunction with "Hot Blast" bagasse furnaces, with unparalleled success in burning this fuel. Large quantities are supplied each season to meet the increased demand of blowers for this service. Wherever forced draft service is required under stationary boilers, singly or in batteries, these fans are of the greatest service, and in many cases, where natural draft is poor, they are indispensable. They are as well suited for burning one variety of fuel as another, though the size of "B" Volume Blower for a given amount of grate surface depends somewhat upon the nature of the fuel being consumed, which should always be referred to in ordering.

In power plants and other locations where large batteries of boilers are employed, and hence require a blower of greater capacity than secured in the largest Buffalo "B" Volume type, and it is not desirable to apply two or more machines of sufficient combined capacity, we build a line of the special steel plate fans previously described, of sufficient single capacity that any service of this nature may be accomplished with one fan. The steel plate fans are furnished either with the engines connected directly to the shaft, or to be driven by pulley and belt.

Buffalo "B" Volume Blowers have been introduced into gas works with pre-eminent success. Several years have elapsed since the first machine was applied for this purpose, and there has been a steady gain in sales for this particular duty since the use of the first blower. A favorite form with gas construction companies is to apply a blower on adjustable bed with combined countershaft, or combined with a Buffalo Double Direct Enclosed Upright Engine. Attention is called to the patented journal bearings employed upon these blowers, which are illustrated by the engraving on page 194. In the cut of Buffalo "B" Volume Blower, on the opposite page, the improved form of bearing is not shown on the exterior view of the blower. For service requiring Buffalo Blowers to be made up blast, or of special discharges, as illustrated on page 212, the price should be figured at 10 per cent. in advance of the regular, as this amount of extra material and time is consumed in their manufacture. For table of detailed dimensions, see page 208. Countershafts for "B" blowers and exhausters are shown and priced on page 217.

GUARANTEE.—Buffalo "B" Volume or Fan Blowers are guaranteed to be built of the best material and workmanship, in a thoroughly workmanlike manner, to run with less power, to be more durable, to be so proportioned as to give the greatest amount of blast and air obtainable in a given size, and to be sold at lower prices for the same size and capacity, than those of any other manufacture.

PRICE LIST, SIZES AND DIMENSIONS "B" BLOWERS.

NO. OF BLOWER	HEIGHT IN INCHES	OUTSIDE DIAMETER OF OUTLET	PULLEYS		PRICE
			Diameter	Face	
1 B	15 $\frac{1}{2}$	5	2 $\frac{3}{4}$	2 $\frac{1}{4}$	\$ 20.00
2 B	19 $\frac{1}{2}$	6	3 $\frac{1}{4}$	2 $\frac{3}{4}$	25.00
3 B	25	7 $\frac{1}{2}$	4	3 $\frac{1}{4}$	33.00
4 B	29	9	5	4	44.00
5 B	32	10 $\frac{1}{2}$	5 $\frac{1}{4}$	4 $\frac{1}{4}$	55.00
6 B	37 $\frac{1}{2}$	12	6 $\frac{1}{2}$	5 $\frac{1}{4}$	70.00
7 B	43	14	7 $\frac{1}{2}$	6 $\frac{1}{2}$	90.00
8 B	48	16 $\frac{1}{2}$	8 $\frac{1}{2}$	7 $\frac{1}{2}$	150.00
9 B	55	18	9 $\frac{1}{2}$	8 $\frac{1}{2}$	200.00
10 B	68	21	12	10	250.00
11 B	79	24	14	12	350.00

Buffalo "B" Volume Blowers,

For Boilers, Heating Furnaces and Forges.

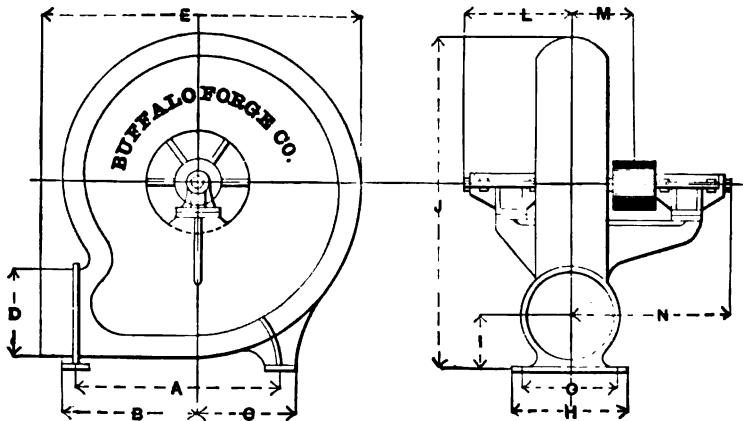


TABLE OF PRINCIPAL DIMENSIONS—IN INCHES.

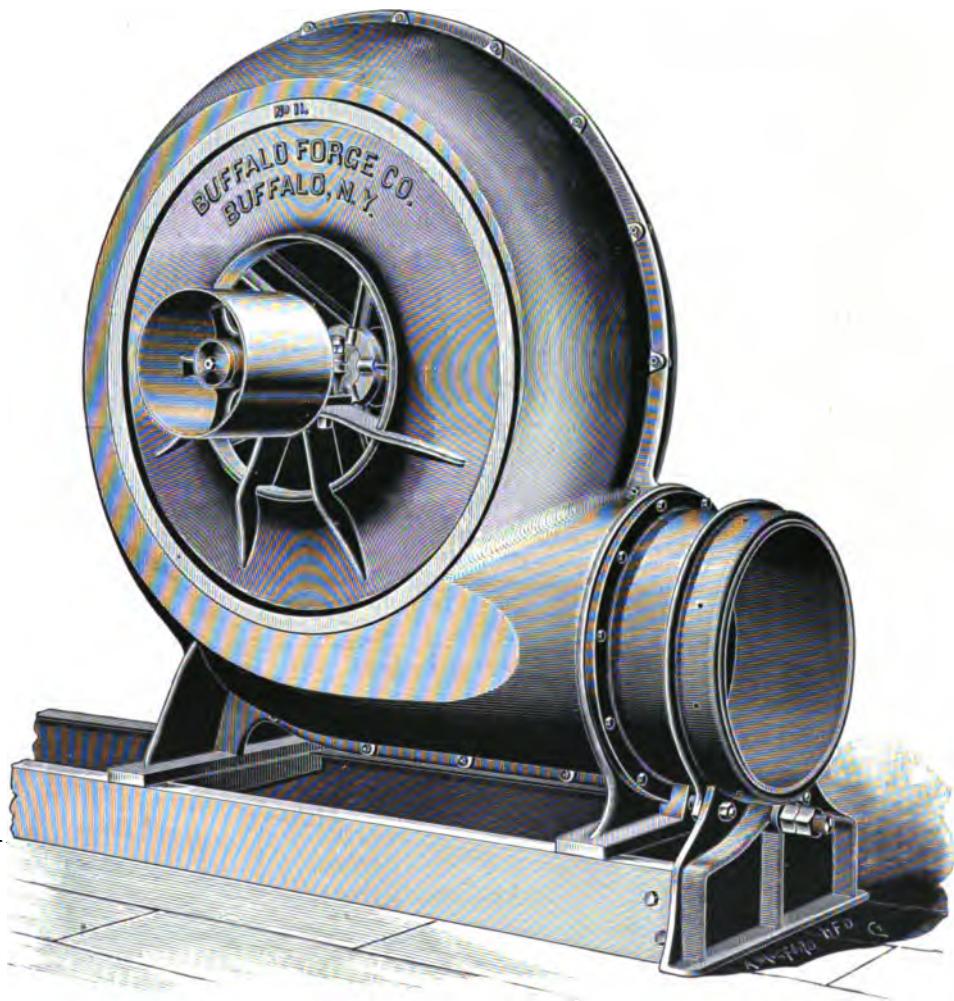
No.	A	B	C	D	E	G	H	I	J	L	M	N	SIZE OF PULLEY		WEIGHT	
													Diam.	Face	Not Packed	Packed
1	10	7 $\frac{1}{2}$	4 $\frac{1}{2}$	4	15	6 $\frac{1}{2}$	7 $\frac{1}{2}$	2 $\frac{1}{2}$	15 $\frac{1}{2}$	6 $\frac{1}{2}$	4 $\frac{1}{2}$	10 $\frac{1}{2}$	2 $\frac{1}{4}$	2 $\frac{1}{4}$	44	75
2	12 $\frac{3}{4}$	10 $\frac{1}{2}$	4 $\frac{1}{2}$	4 $\frac{1}{2}$	19 $\frac{1}{2}$	7	8 $\frac{1}{2}$	3 $\frac{1}{2}$	19 $\frac{1}{2}$	6 $\frac{1}{2}$	4 $\frac{1}{2}$	10 $\frac{1}{2}$	3 $\frac{1}{4}$	2 $\frac{1}{2}$	75	115
3	16	12 $\frac{1}{2}$	6 $\frac{1}{2}$	7 $\frac{1}{2}$	25 $\frac{1}{2}$	9 $\frac{1}{2}$	12	5 $\frac{1}{2}$	25	10 $\frac{1}{2}$	6 $\frac{1}{2}$	11 $\frac{1}{2}$	4	3 $\frac{1}{4}$	165	250
4	20 $\frac{1}{2}$	13 $\frac{1}{2}$	9 $\frac{1}{2}$	9	27 $\frac{1}{2}$	12 $\frac{1}{2}$	15 $\frac{1}{2}$	6	28 $\frac{1}{2}$	9 $\frac{1}{2}$	6 $\frac{1}{2}$	17 $\frac{1}{2}$	5	4	210	275
5	20 $\frac{1}{2}$	16 $\frac{1}{2}$	7 $\frac{1}{2}$	10 $\frac{1}{2}$	31 $\frac{1}{2}$	16 $\frac{1}{2}$	18	6 $\frac{1}{2}$	32	12	8	18 $\frac{1}{2}$	5 $\frac{1}{4}$	4 $\frac{1}{2}$	275	335
6	27 $\frac{1}{2}$	18 $\frac{1}{2}$	11 $\frac{1}{2}$	12	38	15	17	7	39 $\frac{1}{2}$	14	9	23	6 $\frac{1}{2}$	5 $\frac{1}{2}$	357	420
7	30	20 $\frac{1}{2}$	12 $\frac{1}{2}$	14	42	16	18	9	43	15 $\frac{1}{2}$	10 $\frac{1}{2}$	25 $\frac{1}{2}$	7 $\frac{1}{2}$	6 $\frac{1}{2}$	515	585
8	34 $\frac{1}{2}$	23 $\frac{1}{2}$	13 $\frac{1}{2}$	16 $\frac{1}{2}$	47	18	20	9 $\frac{1}{2}$	47 $\frac{1}{2}$	15	12	24 $\frac{1}{2}$	8 $\frac{1}{2}$	7 $\frac{1}{2}$	640	720
9	43 $\frac{1}{2}$	28	18 $\frac{1}{2}$	18	55 $\frac{1}{2}$	20 $\frac{1}{2}$	23	11 $\frac{1}{2}$	55 $\frac{1}{2}$	18 $\frac{1}{2}$	14	29	9 $\frac{1}{2}$	8 $\frac{1}{2}$	1035	1100
10	44 $\frac{1}{2}$	31	19 $\frac{1}{2}$	21	65 $\frac{1}{2}$	21	24	13 $\frac{1}{2}$	68	18 $\frac{1}{2}$	16 $\frac{1}{2}$	34 $\frac{1}{2}$	12	10	1500	1620
11	54 $\frac{1}{2}$	36	24	24	73	25	28	17	79	25	19	25	14	12	2500	2575

The above represents a blower with pulley on the right hand side, as usually made. We can furnish these blowers left hand to order, on short notice, and the regular machines from stock.

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Buffalo "B" Volume Blower,

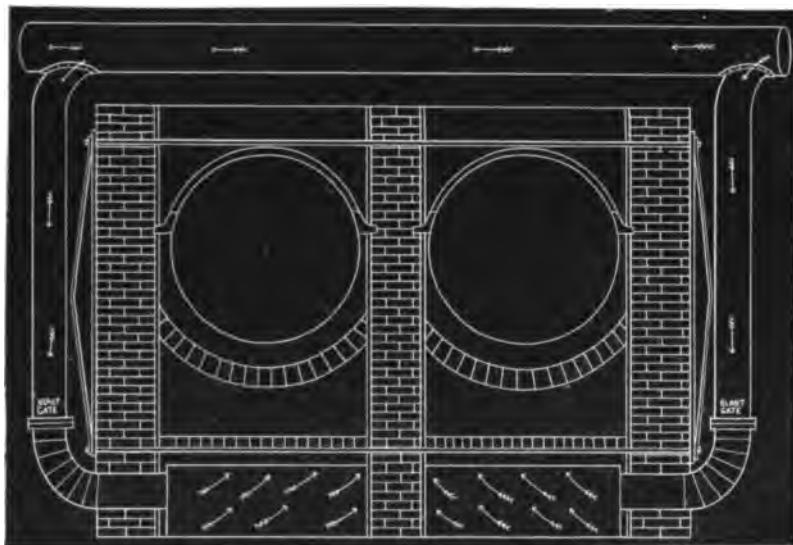
With Overhung Pulleys.



Size No. 11, Built for Extra Heavy Work, with or without Adjustable Bed and Counter-shaft. Also supplied with Double Enclosed Upright Engine.

Buffalo "B" Volume Blowers,

Application to Steam Boilers.



Overhead Main Blast Pipe, with Branches to Each Boiler.

THE above engraving illustrates a common, and oftentimes the most convenient manner of applying Buffalo "B" Volume Blowers for blowing steam boiler fires. The main blast pipe leading from the blower is carried above the boiler, and a separate connection to each is made substantially as shown, with a blast gate in each branch to regulate the supply of air.

Another arrangement, often employed, is to locate the blast pipe or duct underground, in front of the boilers, with a connection to each boiler and the usual blast gate. Vitrified drain pipes, with the joints smoothly cemented up so as to make them air tight, are the most durable, and, undoubtedly, the best material which can be selected for underground use. In some arrangements for forced draft duty, special ash pit dampers are employed, but, in all instances, the object is to properly distribute the air, and prevent its escape in large volume and at a great velocity upon any particular portions of the grates. The use of the blast gate gives perfect control of the amount of air supplied for each boiler, and it should invariably be employed in each branch connection.

The introduction of Buffalo "B" Volume Blowers for creating perfect combustion in steam boilers, has resulted so favorably that they are now universally employed for the purpose. In many locations, very high chimneys or stacks heretofore have been necessary to ensure sufficient draft, and by the use of a blower their height is materially reduced. Existing boilers now in operation having weak draft, may have the combustion readily brought up to the highest standard by the use of one of these machines. They are adapted for burning all kinds of fuel. Reference to the table of capacities will show the speeds and power required for various areas of grate surface, upon which primarily depends the size of blower.

Buffalo "B" Volume Blowers,

Application to Boiler Fires, Furnaces, Etc.

THE table which follows, used in conjunction with the table which appears on page 217, giving the amount of air delivered by each Buffalo "B" Volume Blower at a given pressure and speed, will enable purchasers to intelligently select the size of blower suitable for their requirements for blowing boiler fires. As will be observed, the sizes of pipes herewith given are based upon a velocity therein, corresponding to pressures of one and one and three-quarter ounces per square inch. No allowance has been made for the friction of air in pipes, hence they should be increased in size in proportion to their lengths. A reference to the table of "Friction of Air in Pipes," appearing on a preceding page, will at once show the sizes of pipe which should be selected for any situation. The sizes of blast pipe required, given in table, are for one furnace only; where two or more boilers are connected and supplied with blast by one blower, the size of main pipe required may be obtained by a further reference to the table on equalizing the diameters of pipes.

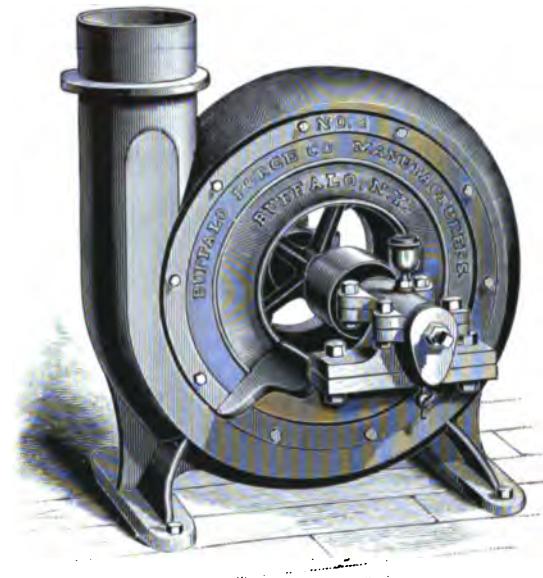
The amount of air and the pressure which should be supplied for each square foot of grate surface in steam boilers, is somewhat dependent upon the nature of the fuel being consumed. From 125 to 150 cubic feet of air per minute will suffice for average requirements, and at from 1 to 3-ounce pressure.

Blast gates should be invariably employed in conjunction with blowers when serving either for blowing boiler fires, furnaces, or other similar uses. Where a number of boilers are being supplied with draft from one blower, gates should be placed in the branch pipes which lead from the main to each boiler, so that the air delivered may be under positive control, and may also be entirely closed off when desired. With every order for a blower, we furnish a diagram of the proper pipe connections, if requested and supplied with the necessary data to prepare same. Table of capacities and speeds for forge fires will be found on page 217.

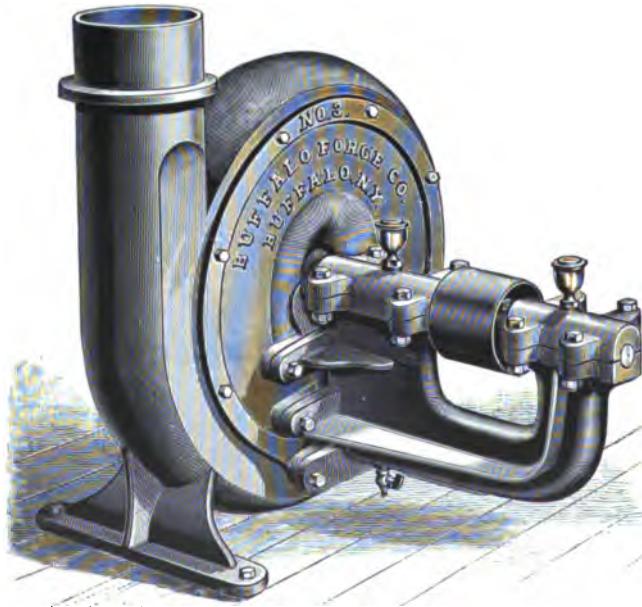
BOILER GRATE SURFACE, AMOUNT OF AIR AND SIZES OF PIPE REQUIRED.

NUMBER SQUARE FEET GRATE SURFACE	CUBIC FEET OF AIR TO BE SUPPLIED PER MINUTE	DIAMETER OF BLAST PIPE REQUIRED	
		1-OUNCE	1½-OUNCE
2	250	3 in.	2½ in.
4	500	4½ "	4 "
6	750	5½ "	4½ "
8	1000	6 "	5½ "
10	1250	6½ "	6½ "
12	1500	7½ "	7 "
14	1750	8 "	7½ "
16	2000	8½ "	8 "
18	2250	9 "	8½ "
20	2500	9½ "	8½ "
22	2750	10 "	9½ "
24	3000	10½ "	9½ "
26	3250	10½ "	10 "
28	3500	11 "	10½ "
30	3750	11½ "	10½ "

Buffalo "B" Volume Blowers and Exhausters.



Buffalo "B" Volume Blower, Right Hand, Up Blast. Fig. 1.



Buffalo "B" Volume Exhauster, Right Hand, Up Blast. Fig. 2. Digitized by Google

Buffalo "B" Volume Blowers and Exhausters.

THESE machines are built with special reference to durability and smooth running under prolonged and arduous service. The journals are long and heavy, and those of the exhausters are supported by the arm with planed surfaces, accurately fitted to the body of the fan, without the interposition of any foreign substance whatever. The joint is absolutely perfect, and all the different parts of the fan are so well proportioned and fitted to each other by the perfected system of gauges and templates in use at our works, that at the highest speed there is practically no vibration. It is impossible for the bearing to be otherwise than in perfect alignment with the body of the exhauster under any service.

The Buffalo "B" Exhausters are built to withstand the action of acid fumes, and the wear of grit and sand, to which they are frequently subjected in various lines of manufacture. Both bearings are on one side, leaving the inlet entirely unobstructed. Like the Buffalo Steel Pressure Blowers, "B" Volume Blowers and Exhaust Fans are built with a solid shell or casing to which the center plates are fitted, and have a smaller number of parts than any others made—an important point in all high speed machinery.

SPECIAL DISCHARGE BLOWERS AND EXHAUSTERS.—On the opposite page, we illustrate two up blast discharge fans of the "B" Volume type. Fig. 1 shows a right hand blower, having both sides open, and a bearing upon each. They are also furnished to discharge top horizontally, bottom horizontally, and down blast, and in right or left hand in any of these styles. It will, therefore, be seen that this adapts them for any position and kind of work. In all cases where a discharge pipe leads directly upward from the blower, it is better to employ an up blast discharge, as illustrated in this cut, as it saves the employment of bends or elbows, and when operating in conjunction therewith, more power is required to perform a given duty than when the course taken by the pipe is direct. Usually, it is desirable to economize room, and in so doing, users too often make the great mistake of employing so short elbows and connections as to materially reduce the efficiency of the blower, and then they fail to appreciate why the desired results are not secured.

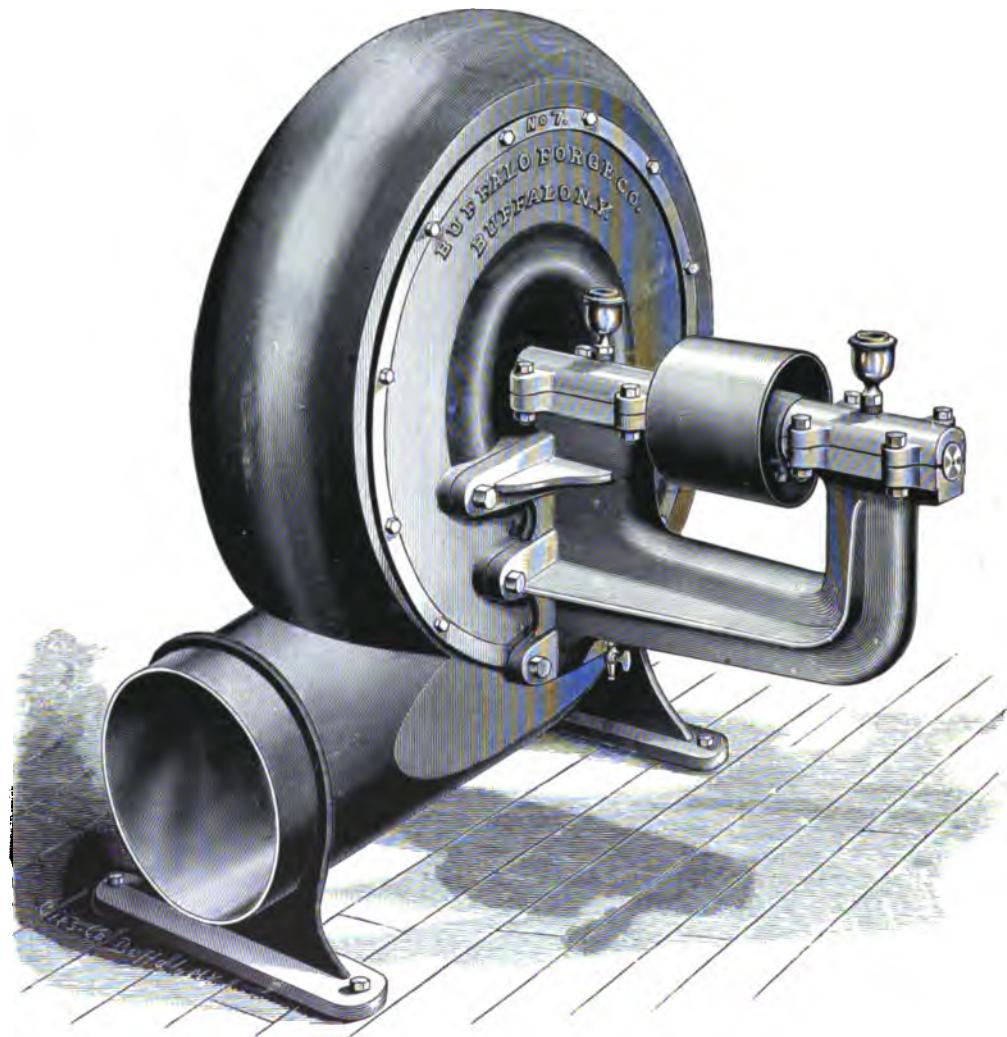
In Fig. 2, we illustrate a Buffalo "B" Volume Exhauster with pulley on the right hand, and also in the up blast discharge. This form of delivery is usually the most desirable when a "B" Volume Exhauster is employed to remove the smoke and gases from forge fires, as the fumes are usually delivered to a stack, or discharged directly upward into the atmosphere outside of the factory.

Buffalo "B" Volume Exhausters are especially adapted for ventilating small apartments of mines and underground passages; for removing the smoke and gas generated in blacksmith shops, chemical works, and manufacturing establishments in general. They are built, when so ordered, with copper or bronze blast wheels, and with the shells coated inside and outside with asphaltum to withstand the destructive results of acid fumes, found in chemical works, sugar refineries, etc., dyeing rooms and varnish factories.

For removing the dust from emery and other polishing wheels, buffing machines, sand wheels and similar work, Buffalo "B" Volume Exhausters stand unrivaled in their efficiency. On following pages, we illustrate the method of making connections, and the variety of hoods which must be employed for various types of polishing wheels. In making such connections to hoods, care should be taken that there are no low places in the pipes where the heavy dust can lodge, and the velocity of air passing into the pipes must be great enough to take all the dust in that direction.

In many lines of manufacture, it is frequently difficult to find floor space wherein a blower or exhauster can be placed. In such examples as this, oftentimes the fan may be located overhead or near the ceiling. For all such conditions, special fans are built by this house, which at once adapts them to existing conditions. It is not an easy matter to successfully drive a blower or exhauster by a crossed belt, as it runs from a large to a small pulley. When the main line runs in such a direction as to involve the use of a crossed belt, if the fan is of a certain discharge, by simply changing the discharge of the fan, the crossed belt feature can be avoided. In one instance, a bottom horizontal discharge fan would become a top horizontal discharge, and the reverse in the other case. The same occurrence takes place where an up blast blower or exhauster is employed, by simply changing the hand of the fan.

Buffalo "B" Volume Exhauster,
With Overhung Wheel.



Bottom Horizontal Discharge, Right Hand.

Buffalo "B" Volume Exhausters,

With Overhung Wheels.

THE engraving appearing on the opposite page illustrates the Buffalo "B" Volume Exhaust Fans as now built, with the exception that the improved patented self-oiling bearings are employed. A detailed description of this, together with an illustration, is given on pages 194 and 195, where reference is made to Buffalo Steel Pressure Blowers. This type of journal is the latest development in blower and exhaust fan bearings, and without question, far exceeds anything yet produced. In their production, the designer had in mind, at all times, the fact that the machines upon which they are used invariably run at a high rate of speed, and to operate without heating or cutting, a positive oil supply at all times must be ensured. No other type of bearing so effectively affords this feature.

Buffalo "B" Volume Exhaust Fans have found wide favor for removing particles from emery wheels, and in this capacity they are universally employed throughout all sections of country. On page 219 will be found a practical illustration of the manner in which connection is made to a row of emery polishing spindles. Outline cuts also appear, showing the method of constructing the necessary adjustable hoods for various types of emery and other wheels. These hoods must be varied in form for special wheels, and decreased in size as the wheel wears away, so that it will be equally efficient at all times and catch all the dust. A hood form for a buffing belt also appears, and clearly indicates the manner of application for such service.

The fine leather dust produced by shoe buffing machines is readily removed by these exhausters, and in many instances a small fan is provided for each machine. In nearly all piping systems, where the "B" Volume Exhausters are employed, much heavier gauge of piping is required than with types of exhausters which are used for other work, for the reason that the material handled is of heavier nature, and would rapidly wear out thin gauges. In the example of smoke forge exhaust equipments, galvanized iron should be invariably employed, and of heavy gauge, to resist the action of the fumes.

Improved Buffalo Countershafts for "B" Exhausters and Blowers are shown and priced on page 218.

With every order, complete drawings will be cheerfully furnished, mentioning the gauges of iron which should be selected, and showing the proper sizes of pipes to secure efficient service from the exhauster. For table of detailed dimensions of these exhausters, see page 216.

For work requiring Buffalo "B" Exhausters to be made up blast, as illustrated on page 212, the price must be figured at 10 per cent. in advance of the regular list, this being the net cost to us for making the change from the regular design.

GUARANTEE.—Buffalo "B" Volume Exhausters are guaranteed to be built of the best material and workmanship, in a thoroughly workmanlike manner, to run with less power, to be more durable, to be so proportioned as to give the greatest suction and expulsive force, and to be sold at lower prices for the same size and capacity, than those of any other manufacture.

PRICE LIST, SIZES AND DIMENSIONS "B" EXHAUSTERS.

NO. OF EXHAUSTER	HEIGHT IN INCHES	DIAMETER OF OUTLET	DIAMETER OF INLET	DIAMETER OF PULLEY	FACE OF PULLEY	PRICE
1 B	15 $\frac{1}{2}$	5	5	2 $\frac{1}{2}$	2 $\frac{1}{2}$	\$ 20.00
2 B	19 $\frac{1}{2}$	6	6	3 $\frac{1}{4}$	2 $\frac{1}{2}$	25.00
3 B	25	7 $\frac{1}{2}$	7 $\frac{1}{2}$	4	3 $\frac{1}{4}$	33.00
4 B	29	9	9	5	4	44.00
5 B	32	10 $\frac{1}{2}$	10 $\frac{1}{2}$	5 $\frac{1}{2}$	4 $\frac{1}{2}$	55.00
6 B	37 $\frac{1}{2}$	12	12	6 $\frac{1}{2}$	.5 $\frac{1}{2}$	70.00
7 B	43	14	14	7 $\frac{1}{2}$	6 $\frac{1}{2}$	90.00
8 B	48	16 $\frac{1}{2}$	16	8 $\frac{1}{2}$	7 $\frac{1}{2}$	150.00
9 B	55	18	18	9 $\frac{1}{2}$	8 $\frac{1}{2}$	200.00
10 B	68	21	21	12	10	250.00

Buffalo "B" Volume Exhausters,

With Overhung Wheels.

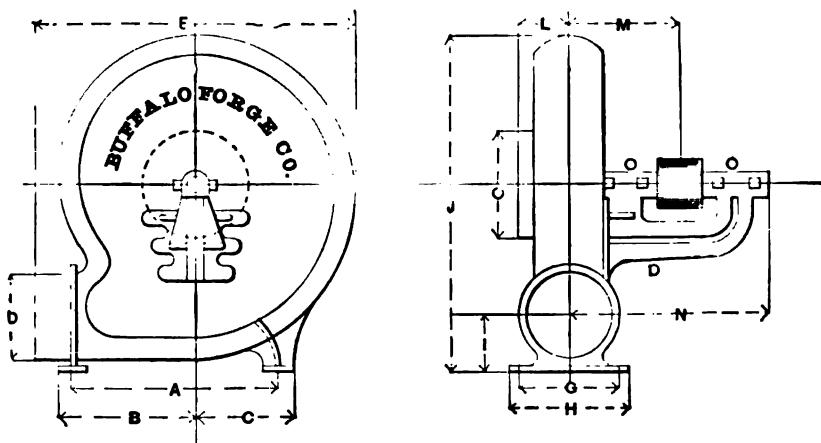


TABLE OF PRINCIPAL DIMENSIONS—IN INCHES.

SIZE	A	B	C	D	E	G	H	I	J	L	M	N	SIZE OF PULLEY		
													Diam.	Face	
1	10	7 $\frac{1}{2}$	4 $\frac{1}{2}$	5	15	6 $\frac{1}{2}$	7 $\frac{1}{2}$	2 $\frac{1}{2}$	15 $\frac{1}{2}$	4	7	12	5	2 $\frac{1}{4}$	2 $\frac{1}{4}$
2	12 $\frac{1}{2}$	10 $\frac{1}{2}$	4 $\frac{1}{2}$	6	19 $\frac{1}{2}$	7	8 $\frac{1}{2}$	3 $\frac{1}{2}$	19 $\frac{1}{2}$	4 $\frac{1}{2}$	9 $\frac{1}{2}$	14 $\frac{1}{2}$	6	3 $\frac{1}{4}$	2 $\frac{5}{8}$
3	15 $\frac{1}{2}$	11 $\frac{1}{2}$	6 $\frac{1}{2}$	7 $\frac{1}{2}$	25 $\frac{1}{2}$	11 $\frac{1}{2}$	13 $\frac{1}{2}$	4 $\frac{1}{2}$	25 $\frac{1}{2}$	4 $\frac{1}{2}$	11 $\frac{1}{2}$	19	7 $\frac{1}{2}$	4	3 $\frac{1}{4}$
4	20 $\frac{1}{2}$	13 $\frac{1}{2}$	10	9	27 $\frac{1}{2}$	13 $\frac{1}{2}$	15	6 $\frac{1}{2}$	28	6	12	19 $\frac{1}{2}$	9	5	4
5	20 $\frac{1}{2}$	16 $\frac{1}{2}$	7 $\frac{1}{2}$	10 $\frac{1}{2}$	31 $\frac{1}{2}$	16 $\frac{1}{2}$	18	6 $\frac{1}{2}$	32	7	13 $\frac{1}{2}$	22 $\frac{1}{2}$	10 $\frac{1}{2}$	5 $\frac{1}{4}$	4 $\frac{1}{2}$
6	27 $\frac{1}{2}$	18 $\frac{1}{2}$	11 $\frac{1}{2}$	12	39	15	17	7	39 $\frac{1}{2}$	8	15 $\frac{1}{2}$	25 $\frac{1}{2}$	12	6 $\frac{1}{2}$	5 $\frac{1}{2}$
7	30	20 $\frac{1}{2}$	12 $\frac{1}{2}$	14	42	16	18	9	43	9	17 $\frac{1}{2}$	29 $\frac{1}{2}$	14	7 $\frac{1}{2}$	6 $\frac{1}{2}$
8	34 $\frac{1}{2}$	23 $\frac{1}{2}$	13 $\frac{1}{2}$	16 $\frac{1}{2}$	47	18	20	9 $\frac{1}{2}$	47 $\frac{1}{2}$	9 $\frac{1}{2}$	19 $\frac{1}{2}$	32 $\frac{1}{2}$	16 $\frac{1}{2}$	8 $\frac{1}{2}$	7 $\frac{1}{2}$
9	43 $\frac{1}{2}$	28	18 $\frac{1}{2}$	18	55 $\frac{1}{2}$	20 $\frac{1}{2}$	23	11 $\frac{1}{2}$	55 $\frac{1}{2}$	12 $\frac{1}{2}$	14	29	18	9 $\frac{1}{2}$	8 $\frac{1}{2}$
10	44 $\frac{1}{2}$	31	19 $\frac{1}{2}$	21	65 $\frac{1}{2}$	21	24	13 $\frac{1}{2}$	68	14 $\frac{1}{2}$	16 $\frac{1}{2}$	34 $\frac{1}{2}$	21	12	10

The above represents the exhauster with pulley on the right hand side, as usually made; can furnish left hand, if desired.

Buffalo "B" Volume Blowers and Exhausters,

Speeds for Various Pressures.

IN APPLYING a blower to supply blast to a plant of stationary forges, the course of piping taken should be as direct as possible. Upon following pages appear a number of diagrams of well arranged blast piping, together with the systems for removing the smoke. It should be borne in mind that in the table which follows, the speed necessary to supply a certain number of forges with blast, at a given pressure, is not estimated for great lengths of pipe. Reference to the table "Friction of Air in Pipes" for the extra power required to force a given amount of air through different lengths, will also indicate what extra speed must be provided for upon a blower operating under such conditions.

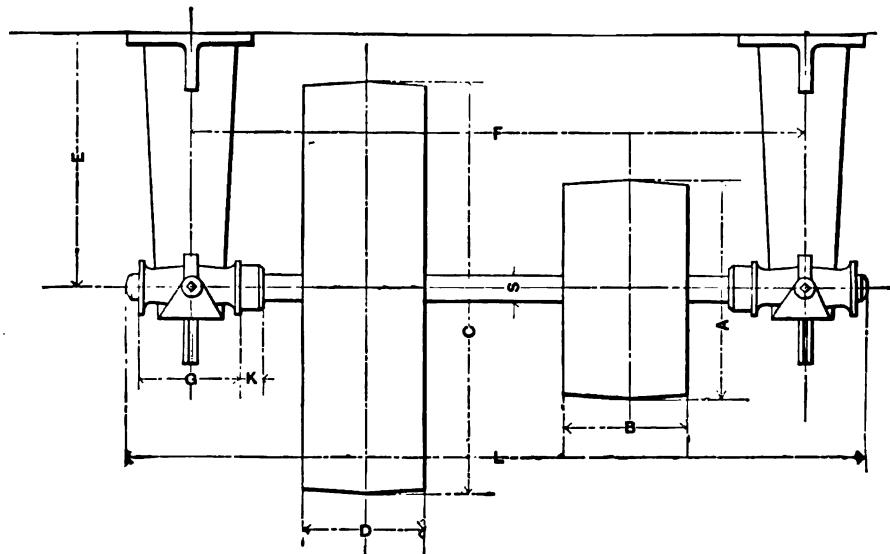
EMERY WHEELS.—The Buffalo "B" Exhausters are especially adapted for removing the refuse from emery wheels, buffing wheels, etc. Outline cuts of application appear elsewhere. It is usually necessary to run the exhausters to a speed sufficient to produce 4 to 5-oz. pressure for average work, in handling emery particles. The table below gives the requisite speed for such pressures, although referring principally to the application of Buffalo "B" Volume Blowers to forge fires.

TABLE OF SPEEDS AND CAPACITIES OF BUFFALO FAN BLOWERS, AS APPLIED TO FORGE FIRES.

No. of Blower	No. of Forges Ordinary Size	2-OUNCE PRESSURE		4-OUNCE PRESSURE		5-OUNCE PRESSURE		6-OUNCE PRESSURE		7-OUNCE PRESSURE	
		Speed —No. of Revolu-tions	Cubic Feet of Air per Minute	Speed —No. of Revolu-tions	Cubic Feet of Air per Minute	Speed —No. of Revolu-tions	Cubic Feet of Air per Minute	Speed —No. of Revolu-tions	Cubic Feet of Air per Minute	Speed —No. of Revolu-tions	Cubic Feet of Air per Minute
1 B	4	3397	513	4824	729	5405	817	5934	897	6442	961
2 B	7	2935	697	4070	990	4561	1108	5007	1217	5419	1318
3 B	10	1983	1100	2794	1563	3130	1751	3436	1922	3719	2080
4 B	15	1706	1614	2429	2292	2721	2569	2987	2819	3233	3055
5 B	24	1529	2206	2180	3128	2444	3503	2681	3844	2902	4161
6 B	30	1383	2896	1966	4116	2202	4612	2417	5062	2618	5371
7 B	42	1183	3925	1694	5575	1898	6247	2084	6856	2255	7412
8 B	60	1014	5466	1447	7763	1621	8698	1780	9548	1927	10335
9 B	90	897	6530	1255	9274	1406	9891	1544	11406	1671	12346
10 B	150	706	8878	995	12608	1114	14127	1224	15507	1325	16785
11 B	230	597	11594	830	16463	930	18448	1021	20249	1105	21918

Buffalo Improved Countershafts,

For "B" Volume Blowers and Exhausters.

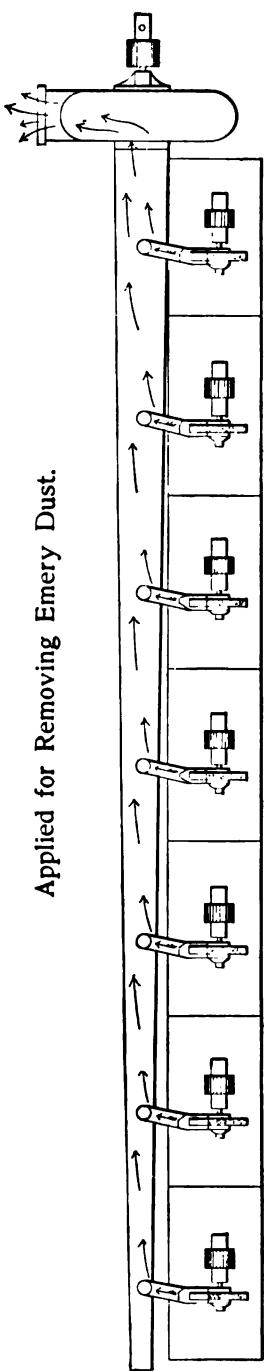


PRICE LIST AND TABLE OF DIMENSIONS—IN INCHES.

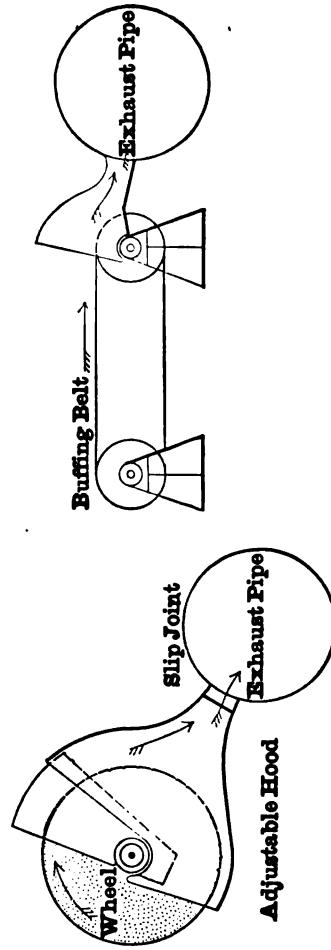
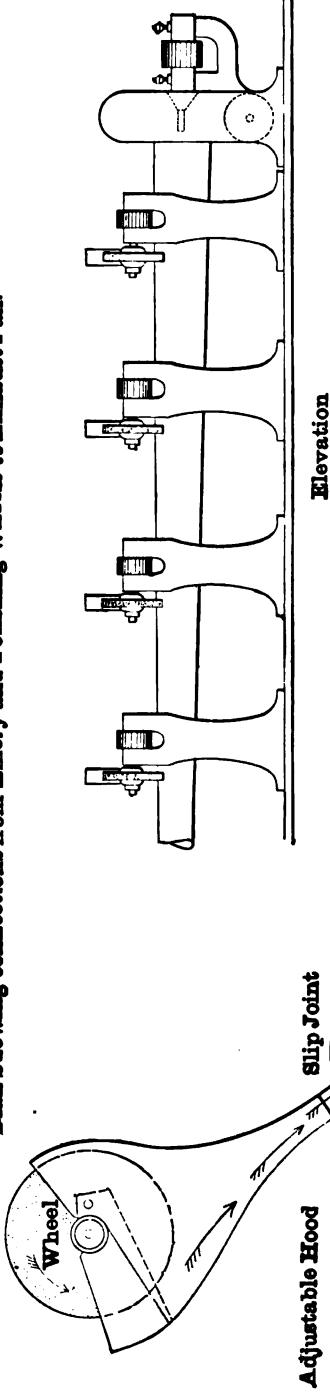
NO. OF COUNTER- SHAFT	S	L	A	B	C	D	E	F	G	K	NO. OF "B" BLOWER OR EXHAUSTER	PRICE
1	1 $\frac{1}{8}$	22 $\frac{3}{4}$	6	4	16	2 $\frac{1}{4}$	9 $\frac{1}{4}$	18 $\frac{1}{4}$	4	1 $\frac{1}{8}$	1	\$12.00
2	1 $\frac{1}{4}$	25 $\frac{1}{2}$	7	4 $\frac{1}{2}$	18	2 $\frac{3}{4}$	9 $\frac{1}{4}$	21 $\frac{1}{2}$	4 $\frac{1}{2}$	1 $\frac{1}{4}$	2	14.00
3	1 $\frac{3}{8}$	28	8	4 $\frac{1}{2}$	21	3 $\frac{1}{4}$	10 $\frac{1}{4}$	22 $\frac{3}{4}$	5	1 $\frac{3}{8}$	3	18.00
4	1 $\frac{1}{8}$	31	9	5	26	4	12 $\frac{1}{8}$	25 $\frac{1}{4}$	5 $\frac{1}{2}$	2	4	24.00
5	1 $\frac{1}{4}$	34 $\frac{1}{4}$	10	5 $\frac{1}{2}$	30	4 $\frac{1}{2}$	15 $\frac{1}{8}$	28	6	2 $\frac{1}{4}$	5	30.00
6	1 $\frac{1}{3}$	37 $\frac{3}{4}$	12	6	32	5 $\frac{1}{4}$	16 $\frac{1}{4}$	31	6 $\frac{1}{2}$	2 $\frac{1}{2}$	6	40.00
7	2 $\frac{1}{4}$	40 $\frac{1}{2}$	14	6	36	6 $\frac{1}{2}$	18 $\frac{1}{8}$	33	7	2 $\frac{3}{4}$	7	50.00
8	2 $\frac{7}{8}$	46 $\frac{3}{4}$	16	8	40	7 $\frac{1}{4}$	20 $\frac{1}{2}$	39	7 $\frac{1}{2}$	3	8	65.00
9	2 $\frac{3}{4}$	51	18	8	42	8 $\frac{1}{2}$	23 $\frac{1}{2}$	40	9	3	9	80.00
10	3	56	20	9	44	10	23 $\frac{1}{2}$	45	9	3 $\frac{1}{2}$	10	85.00
11	3	61	22	10	48	12	23 $\frac{1}{2}$	50	9	3 $\frac{1}{4}$	11	90.00

Buffalo "B" Volume Exhaust Fans,

Applied for Removing Emery Dust.



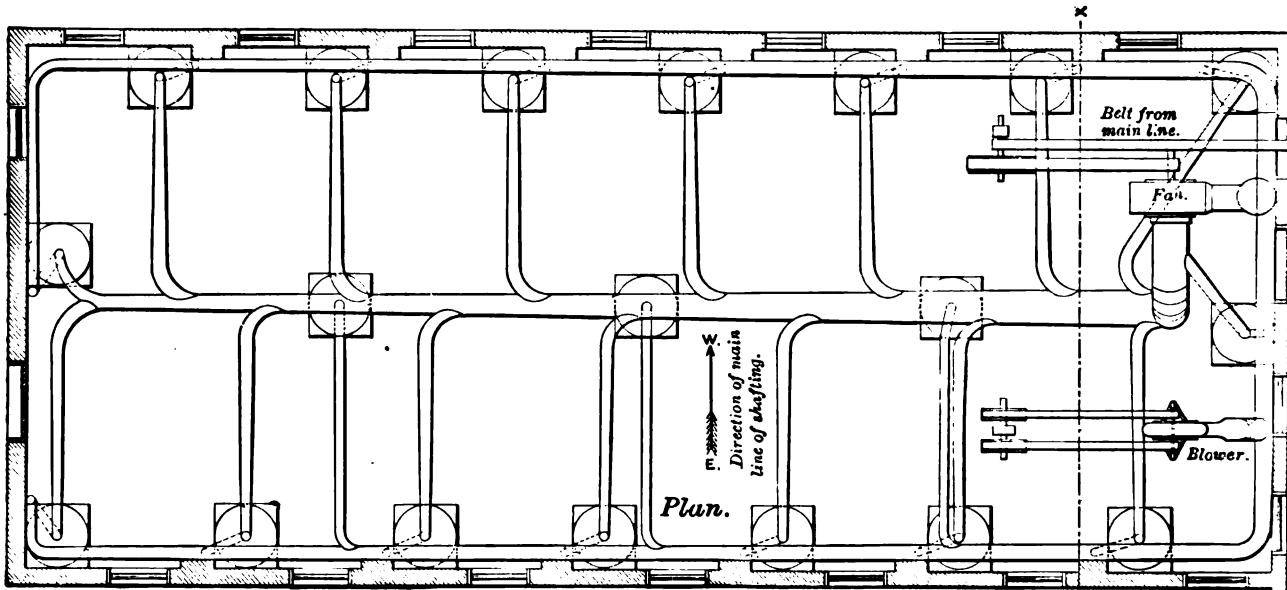
Plan Showing Connections from Emery and Polishing Wheels to Exhaust Fan.



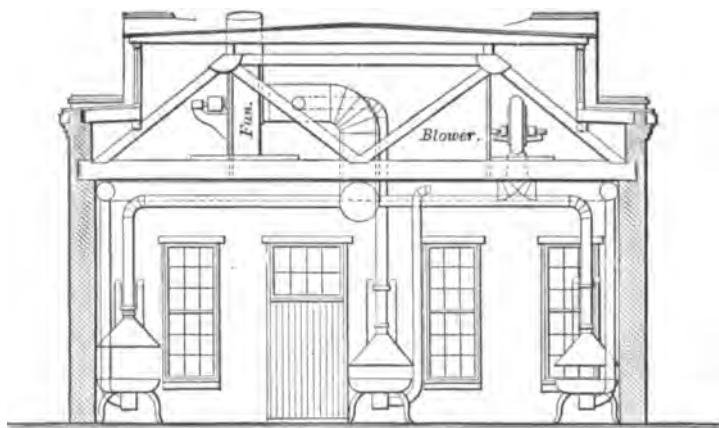
Exhauster, Right Hand Bottom Horizontal Discharge.

Buffalo Blacksmith Shop Equipments,

In Manufacturing Establishments.



American Brake Co. Detail Fig. 1.



American Brake Co. Detail Fig. 2.

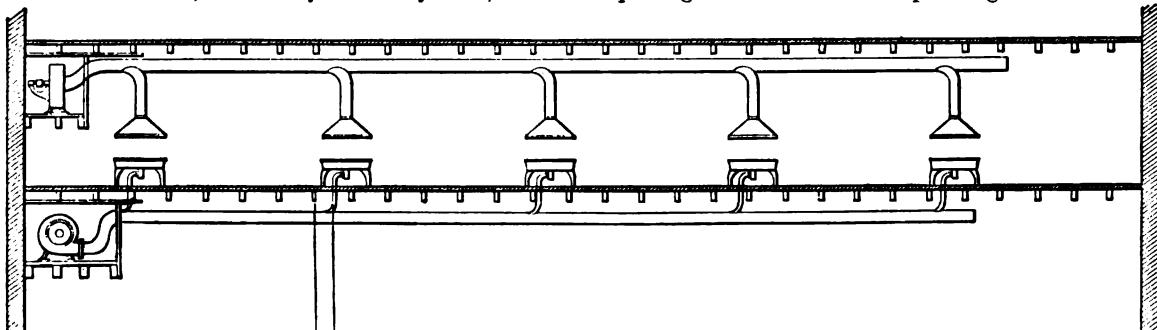
THE two outline engravings herewith illustrate the equipments of Buffalo Forges, Blowers for furnishing the biast, Exhaust Fan and piping connections for removing the smoke, which were furnished by this house for the American Brake Co., St. Louis, Mo. Fig. 1 gives the plan of the layout, showing both the position of the blower and exhaust fan, and the course taken by the two distinct runs of piping. In detailed Fig. 2, a section of the building is shown, together with the elevated position of the exhauster and also the blower. The building being a one-story structure of the gallery type, the position naturally selected for the forges was near the walls and such that the least amount of floor space would be consumed in placing the entire equipment.

Buffalo Blacksmith Shop Equipments,

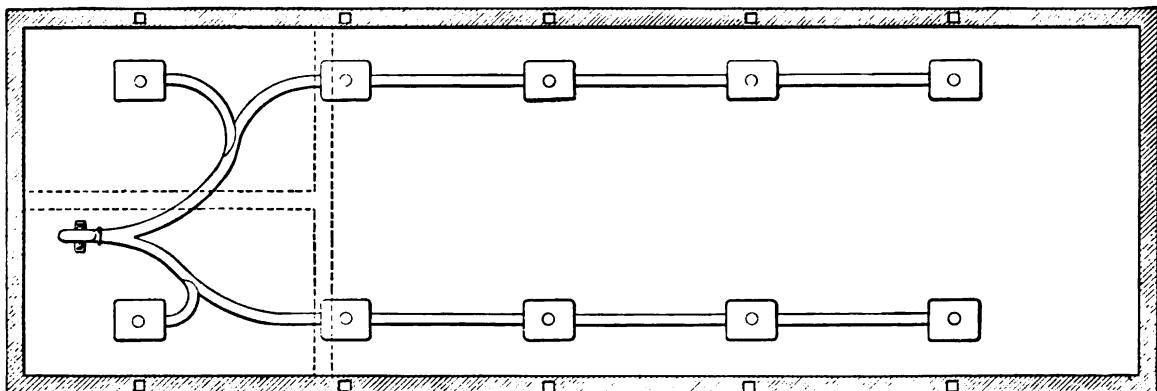
In Carriage Factories.

AS THE line of Buffalo Forges affords from four to six times the variety of machines built by other concerns, and embodies a forge suited to every possible requirement, the desirability of placing an order for an entire blacksmith shop equipment is clearly apparent to the careful buyer. In carriage manufacturing establishments especially, we find great demand for these goods. There are but few prominent manufactoryes in this line which are not outfitted with an equipment of Buffalo Stationary Forges, Blowers and Exhausters. A reference to the Forge department of this catalogue will show several forges designed solely for the use of the carriage trade. The outline cuts below show a small equipment in a carriage manufactory, and are here presented as exhibiting a blower application for furnishing the blast where the pipes are carried underneath the floor. The blower employed is of the "B" type, and is located in the basement, as will be observed by detail Fig. 1. A top horizontal discharge would have been selected to save the bend in the pipe, had it not been first intended to locate the blower on the ground floor, instead of in the basement. Space in the latter not being of particular value, however, equally effective results have been obtained by making this connection to the straight pipe on an easy curve.

In detail Fig. 2 is shown the course taken by the blast piping in supplying the rows of forges on either side of the blacksmith shop. Usually, it is desirable to locate the forges nearer the wall than is herewith shown, and it may be readily done, without impairing the convenience of operating.



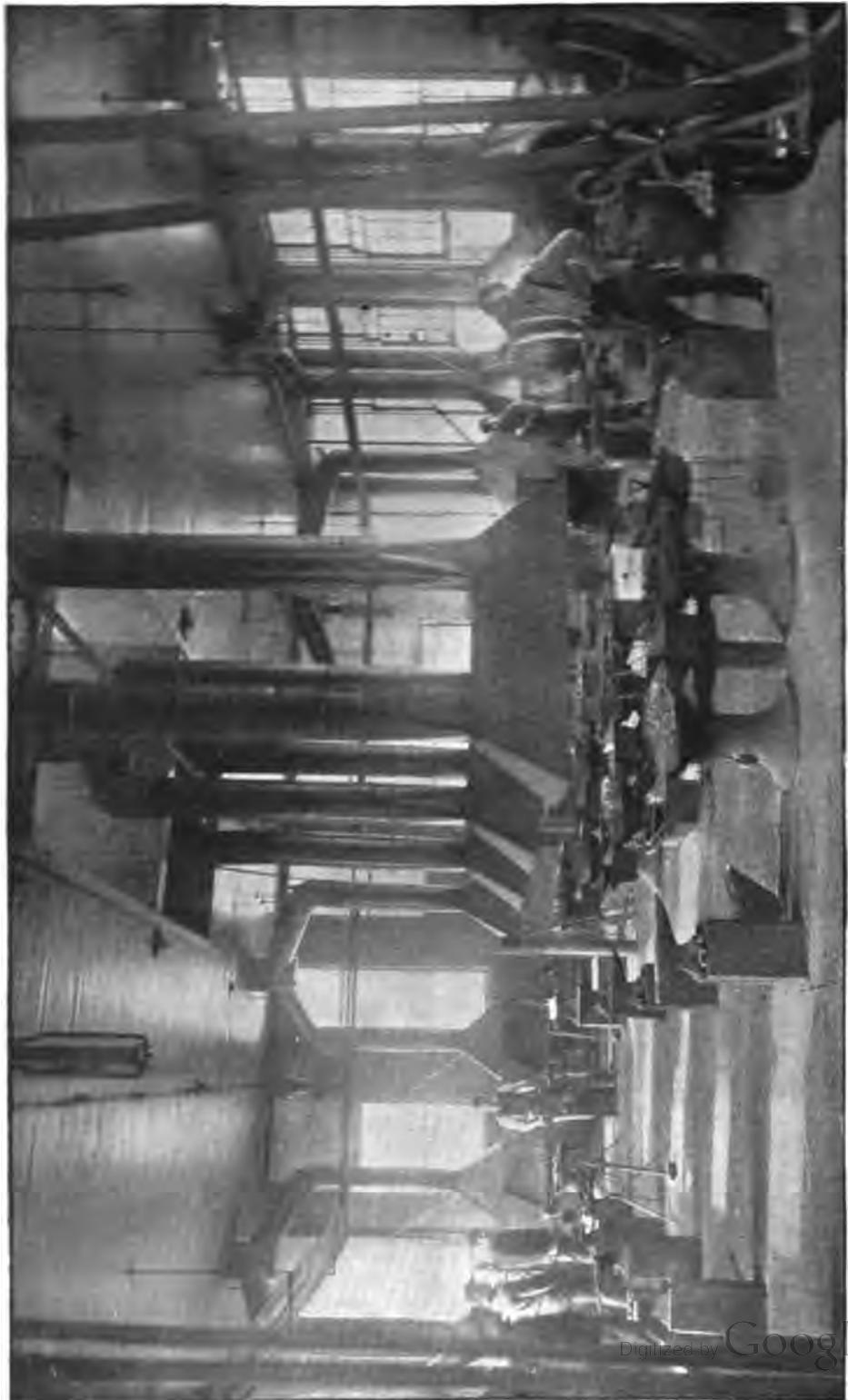
Detail Fig. 1.



Detail Fig. 2.

Buffalo Blacksmith Shop Equipments,

In Manual Training Schools and Colleges.



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Buffalo Blacksmith Shop Equipments,

For Manual Training Schools and Colleges.

IT HAS been the great pleasure of this house to outfit all the leading manual training schools and colleges, not only throughout America, but foreign countries as well, with Buffalo Forges, Blowers, Exhausters, Hot Blast Heating and Ventilating Apparatus, Punch Shear and Bar Cutters, Drills and other tools.

In Fig. 1 we illustrate the blacksmith shop of Sibley College, Cornell University, Ithaca, N. Y., in which is an equipment of Buffalo Stationary Forges of various designs, with the usual accessories of blowers for furnishing the blast, and a steel plate exhauster for removing the smoke. As these institutions are primarily intended to teach the most approved methods of shop practice, and the efficient equipping of large plants, it is but natural that the best and most approved designs of machinery of all kinds should be employed in its technical departments. It is due solely to this reason, that the various Buffalo machines have found so ready a demand by these schools. Many of these colleges further keep pace with the times by ordering all improved Buffalo blacksmith tools, as they are brought out from year to year. Not only is every State establishing similar training schools, but many of the leading cities are doing likewise. For the half-tone engraving of the shop interior at Sibley College, we are indebted to the courtesy of Cassier's Magazine, New York. The photo is by an amateur student.

In Fig. 2 appears an illustration of the blacksmith shop of the Toledo Manual Training School, Toledo, O. The entire equipment was supplied by this house and consists of a large plant of Buffalo Stationary Forges of the various designs hereafter illustrated, together with a Buffalo Steel Pressure Blower for supplying the blast, and a Buffalo Steel Plate Exhauster for removing the smoke produced by the fires. In a recent communication, we learned from the superintendent, Mr. Geo. S. Mills, that he had visited every training school of prominence throughout this country, and the blacksmith shops, especially, present a familiar appearance, in that the same equipments of Buffalo outfits are almost invariably found. The plant at the Toledo Manual Training School is a complete one in every respect, and Mr. Mills states that he has yet to see a better arranged or more efficient one. With every order for Buffalo Forges and Fans, complete detailed drawings and specifications of the piping system are supplied. We are always pleased, where desired, to furnish the faculty of manual training schools with exhibition drawings of blacksmith shop equipments, and of hot blast heating and ventilating plants which have been installed into some of the largest manufacturing establishments. These are often of intense interest and value to students, who find ready employment in the arrangement and construction of new plants upon leaving school. Special designs of Buffalo Forges are often built to suit peculiar spaces in technical schools, for example see pages 227 to 230.

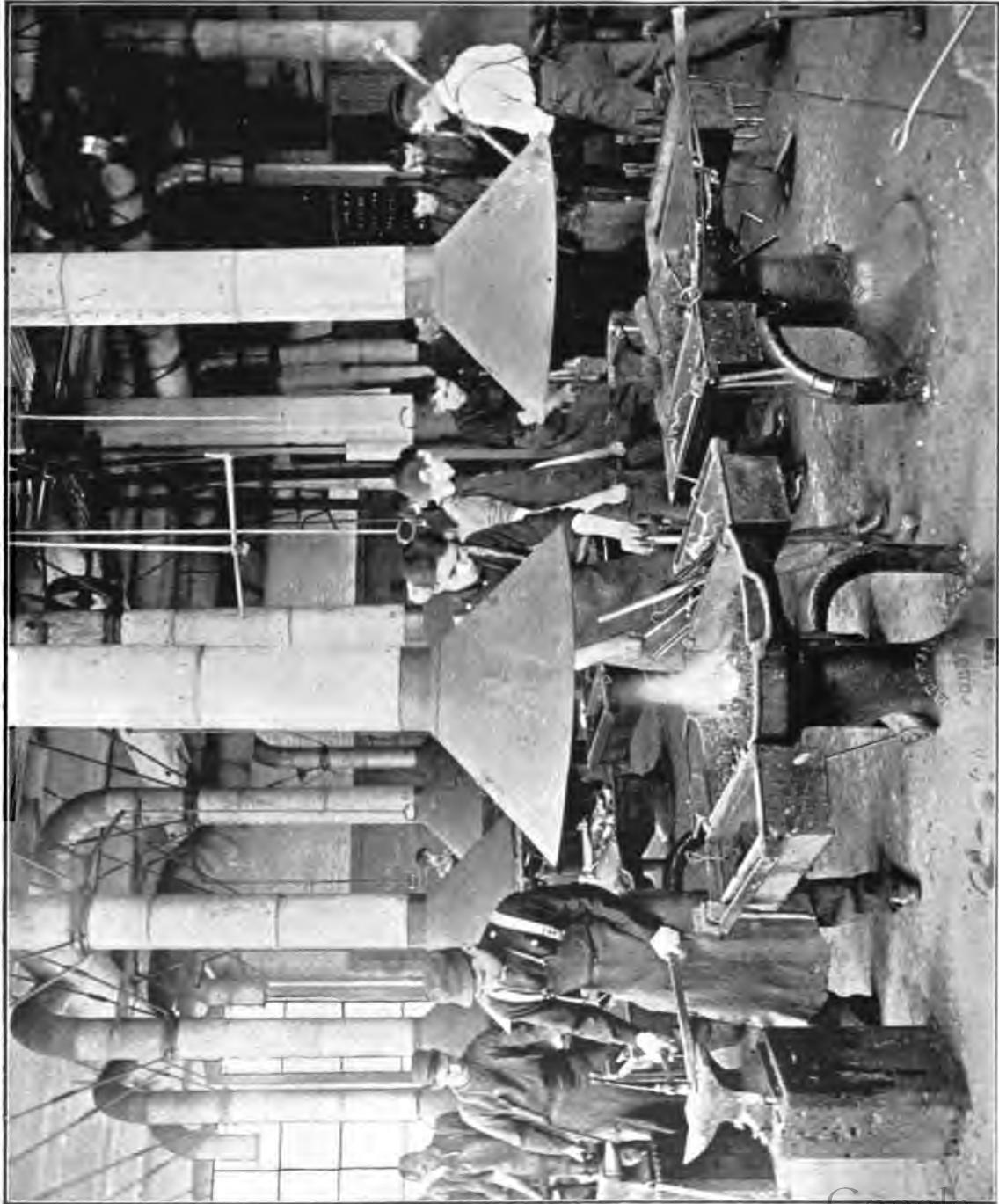
Below we append a partial list of technical schools and colleges, in different sections of the country, which have been outfitted with equipments of Buffalo Forges, Blowers and Exhaust Fans. Many have also been furnished with the Buffalo Hot Blast System of Heating and Ventilation, described on previous pages.

Pennsylvania University Buildings, Philadelphia, Pa.
University of Michigan, Ann Arbor, Mich.
Arkansas Industrial University, Fayetteville, Ark.
N. Y. State Reformatory, Elmira, N. Y.
Manual Training School, Toledo, O.
Pennsylvania State Reform School, Morganza, Pa.
Socckannossett School, Socckannossett Station, R. I.
Lincoln Institute, Jefferson City, Mo.
Elgin Academy, Elgin, Ill.
State School of Technology, Atlanta, Ga.
Public Training School, Milledgeville, Ga.
Miller Manual Labor School, Crozet, Va.
University of Tennessee, Knoxville, Tenn.
Alabama Polytechnic Institute, Auburn, Ala.
Manual Training School, Washington, D. C.
Massachusetts State Reformatory, Concord Junction, Mass.
Chicago Training School, Chicago, Ill.
Manual Training School, St. Louis, Mo.
West Side Manual Training School, Cleveland, O.
State Ag'l College, Logan, Utah.
Manual Training School, Louisville, Ky.
Dolgeville Academy, Dolgeville, N. Y.

State Ag'l & Mech. College, College Station, Texas.
New Haven Manual Training School, New Haven, Conn.
Ohio State University, Columbus, O.
Sibley College of Cornell University, Ithaca, N. Y.
State College of Kentucky, Frankfort, Ky.
Institute of Technology, Boston, Mass.
Yale College, New Haven, Conn.
Atlanta Training School, Atlanta, Ga.
S. C. Industrial School, Omaha, Neb.
Manual Training School, Baltimore, Md.
Haverford College, Haverford College P. O., Pa.
Pennsylvania Industrial Reformatory, Huntingdon, Pa.
Manual Training School, Minneapolis, Minn.
State Ag'l College, Corvallis, Ore.
Michigan Mining School, Houghton, Mich.
Vanderbilt University, Nashville, Tenn.
State Ag'l & Mech. College, Ames, Ia.
Hampton N. & A. Institute, Hampton, Va.
Branch Normal School, Pine Bluff, Ark.
West Virginia University, Morgantown, W. Va.
Mississippi Ag'l College, Starkville, Miss.
Manual Training School, Honolulu, Hawaiian Islands.

Buffalo Blacksmith Shop Equipments,

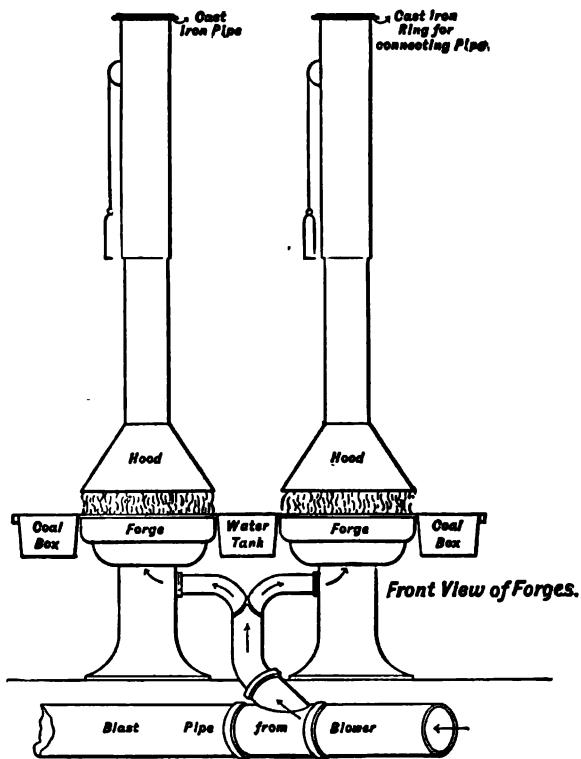
In Manual Training Schools and Colleges.



The Smith Shop of Toledo Manual Training School, Toledo, Ohio.

Buffalo Forge Exhaust Outfits,

For Blacksmith Shops.



Hood, Telescopic Joint, Automatic Valve, Etc.

THE above engraving illustrates the latest construction form of Buffalo Patented Exhaust Outfits, as used in our equipments of blacksmith shops. It will be seen that the appurtenances for each individual forge consists of a hood, telescopic joint, counterbalance weights, automatic valve, etc. A great improvement over the form which we previously furnished, lies in there being no long lengths of wire cable with weights attached, outside of the pipe. With many customers, it is more economical, on account of the saving in freight charges, to have the piping made in their own city, and in such instances we furnish the necessary drawings with specification of gauges of iron, when given the order for the forges, blower and exhauster. We find large demand for the above equipment for individual forges, and the cost of a complete outfit, as illustrated, per fire, is placed at the low figure of \$7.50.

When first starting the fire, the telescopic joint permits of the hood being brought down close thereto, and when work is being handled upon the forge, the hood may easily be raised up out of the way, and still remove the smoke and gases produced.

Aside from our work in this line being employed in leading training schools referred to on accompanying pages, it may be seen in such well-known shops as those of the Union Pacific R. R System, Lehigh Valley R. R., Lackawanna R. R., and in the blacksmith shops of Haydock Bros., International Carriage Co., Barber Asphalt Co., South Superior Improvement Co., Solvay Process Co., etc., etc.

Buffalo Stationary Blast Forges,

Designed for Shops Provided with Fan Blast.

FOUR Buffalo Stationary Blast Forges of regular design are illustrated on the following pages, together with two Special Stationary Forges, which are intended for technical schools and experimental work.

The term "stationary blast," employed in connection with Buffalo Forges, is not selected because the forges are immovable, like the old-fashioned brick type, for they are easily portable. An independent blower is invariably used for supplying the blast, and hence the source of the blast being stationary, this term is derived. The various standard machines are suitable for all kinds of service, and few manufacturing establishments of prominence, which have the accessory of a blacksmith shop, can be found where one or more Buffalo Forges are not used therein.

In the smith shops of iron-working industries, convenient outfits of the various patterns of Buffalo Forges illustrated herewith are employed, the machines being usually located in rows close to the wall, as indicated by the engravings which have appeared on previous pages. This allows of the introduction of steam hammers and other tools between the forges, where such a feature is desirable. In fitting up a forge shop for general work, and in selecting the different designs, the buyer who seeks to have a well arranged and efficient plant will include a variety of the Buffalo Stationary Blast Forges, locating those of large capacity where the heaviest work is to be performed, and likewise suitably placing those intended for light work. All of the Buffalo Stationary Blast Forges, though light in appearance, are very strong. They are much more efficient and presentable in appearance than any brick forge, and further, can be very readily moved when desired. The first cost of a forge plant will be found very materially lessened by the employment of Buffalo Stationary Blast Forges instead of the antiquated brick forge. Another point which should be borne in mind, is that here the expense practically ends. Repairs are seldom, if ever, required, and in the matter of durability they are unequalled. As to their efficiency, there is no room for comparison, being unrivaled by anything yet produced.

Hoods are not furnished with any of the stationary forges, unless especially ordered. On the preceding page will be found a description of the outfits usually employed. These hoods, in the regular form of construction, may be supplied singly, in pairs, or of special shapes, to meet existing conditions.

It is usually best to have the blower which supplies the blast located near the largest forges, or those which will require the greatest amount of air or the heaviest blast. Frequently, the smoke exhauster can be likewise placed, and avoid carrying the majority of the smoke and fumes which arise from the strongest fires over long stretches. Where this is done, the piping for smoke exhaust systems will be reduced to a minimum, and the best results will be secured.

Plans and estimates for the entire equipment of blacksmith shops with Buffalo Stationary or Portable Forges, Blowers for supplying the blast, Exhausters and Piping for removing smoke, will be cheerfully furnished, either for manual training schools, or the forge department of any manufacturing establishment.

Buffalo Stationary Blast Forges.

(CONTINUED.)

BUFFALO FOUR-FIRE STATIONARY FORGE.—The engraving appearing on page 224 clearly illustrates the construction of this machine, which was designed for the Texas State Manual Training School. It is intended for the use of four operators, and each fire is furnished with a separate blast gate, and the Buffalo Patented Tuyeres, described and illustrated on pages 228 and 235. This matchless forge has found wide favor among training schools, and, with the usual other appurtenances, has been supplied in a number of instances in carload lots.

BUFFALO SPECIAL TWO-FIRE STATIONARY FORGE.—Like the above machine, this was originally gotten out for a manual training school; a more recent and marked improvement, however, has been made in the design of a two-fire forge, which is not here illustrated. Training schools desiring a single forge, with fires for two operators, will be cheerfully furnished with the drawings of the latest development, together with estimates. If desirable, special forges of three and five fires each may also be supplied for technical schools, several of such styles having been built. Drawings will be submitted to such schools as require these styles and orders can be filled promptly, as patterns have been made for previous sales.

BUFFALO STATIONARY FORGE NO. 03.—This machine was primarily designed for the Union Pacific R. R. System, being in use in their various shops. It is especially adapted to meet the requirements of such extra heavy work as is found in these locations. For this service, a wide demand has been made for this forge by various other iron-working industries. It is far superior, cheaper, handsomer and more efficient than any brick forge. The fire pit has a depth of eight inches, admitting of a strong, deep fire, which is necessary in handling large and heavy work. When light work is being performed, the gates on the sides can be opened, and the fire lowered four inches. The regular tuyere is designed especially to withstand heavy service without burning out. The latest improved type, fully described on page 228, may also be furnished, and will be found well worth the extra cost of the arrangement. A 3½-inch wind gate or valve is supplied for regulating the blast. The water and coal boxes are cast in one piece with the fire-pan, being divided by a sloping partition for easy removal of coal. The forge has all possible conveniences for handling work quickly, and is the most complete one made for a wide range of light and heavy service.

BUFFALO STATIONARY FORGE NO. 008.—This machine is especially intended for heavy work and has found wide favor with carriage builders, being primarily designed for this class of service; it is also of inestimable value in wagon and agricultural implement manufactories; in every point it is a complete forge. Its design combines coal box and water tank, and it is also furnished with a blast gate with lever convenient to the operator, placing under perfect control the regulation of the blast. It will be found equally well adapted for light or ordinary work in general. The regular tuyere is excellent in every respect, but our latest development, or the patented dumping tuyere described and illustrated on pages 228 and 235, may be supplied at a nominal cost, and will be found to more than justify the expense in the results obtained.

BUFFALO STATIONARY FORGE NO. 02.—The forge illustrated on page 233, originally was built for the lighter classes of work in carriage, wagon and other agricultural implement manufactories, though there is a large demand for it on light or ordinary work in all lines of iron industries. Where special designs of forges are not desired for manual training schools, this style is very heavily drawn upon in outfitting the blacksmith shops of such institutions.

As will be observed by the half-tone cut of Sibley College, frequently the No. 02 Forges are placed in pairs. Thus arranged, they afford the greatest convenience. A few No. 008 Stationary Forges invariably are included in such outfits, for handling heavy work, but the No. 02 is the greater favorite, for the reason that more light work is performed in the experiments made in such institutions, than heavy.

Buffalo Stationary Blast Forges.

(CONTINUED.)

BUFFALO STATIONARY FORGE NO. 02. (*Continued.*)—It may be furnished as originally designed with the anti-clinker revolving ball tuyere, or with the patented tuyere illustrated on page 235. The ash pit box extends down through to the side, for convenience in removing ashes. A lever attachment to blast gate, convenient to the smith's hand, is a feature, and insures instantaneous and positive regulation of blast. Gates are provided at both ends of the forge for the purpose of increasing the depth of fire when desired. The tool rest in front and racks on both sides make this the most complete, as well as the most graceful, design of forge upon the market. .

BUFFALO STATIONARY FORGE NO. 08.—This machine is adapted for light and moderate work, and is of the same capacity and construction as the Portable Blacksmith Forge, described on a following page. For the work for which it is intended, its excellence is unrivaled. There is scarcely a shop where one or two of these machines will not be found invaluable, being a model of convenience.

BUFFALO STATIONARY FORGE NO. 18.—This forge is the most diminutive one manufactured by this house for stationary blast. In general capacity, it is somewhat less than the No. 08. In height, however, it exceeds this by one inch, though the fire pan is only 21 x 27 inches. For very light service, where an inexpensive arrangement is required, we can confidently recommend this forge.

BUFFALO PATENTED ANTI-CLINKER DUMPING TUYERE.—On page 235 will be found two illustrations of this device. The detailed Fig. 1 gives a section of a Buffalo 00S Stationary Forge, showing the operation of the tuyere. Every smith is familiar with the delay caused by the old style of forges, when it becomes necessary to clean the fire. The live coals must be removed before the ashes and clinkers can be reached. Time is then lost waiting for the fire to come up. By the use of this device, this difficulty is entirely obviated. The construction of the tuyere and its application to Buffalo Stationary Forges, is such that all clinkers, ashes, etc., can be dropped out at the bottom, while the fire is still held in position undisturbed. This house, before adopting the device to any great extent, or offering it for sale, thoroughly tested it in our own blacksmith shop applied to all the different designs of Buffalo Stationary Forges. To further make sure of the good qualities of the tuyere, it has been tested in other shops, under the heaviest service, for several years. Many old customers for Buffalo Forges, who have lately purchased additional machines, are now having the Buffalo Patented Anti-clinker Dumping Tuyere applied to all their previous forges. To all such, the tuyere will be furnished at a figure slightly above cost.

PRICE LIST, SIZES AND DIMENSIONS.

NAME OF FORGE	FIRE PAN	DIMENSIONS IN INCHES						WEIGHT	PRICE WITH ORDI- NARY TUYERE	NET PRICE WITH PATENT DUMPING TUYERE			
		COAL TANKS			WATER TANKS								
		Length	Width	Depth	Length	Width	Depth						
Stationary 03	61 x 48	17 $\frac{1}{4}$	12	10 $\frac{1}{2}$	29	12	10 $\frac{1}{2}$	26	720 lbs	\$70.00 \$2.00 extra			
" 00S	38 x 51	27 $\frac{1}{2}$	9	6 $\frac{1}{2}$	36	9	8	26	425 "	40.00 2.00 "			
" 02	26 x 36	27 $\frac{1}{2}$	9	6 $\frac{1}{2}$				26	325 "	34.00 2.00 "			
" 08	28 x 40							26	160 "	20.00 2.00 "			
" 18	21 x 27							27	80 "	15.00 2.00 "			

Buffalo Special Stationary Blast Forge,

Designed for Four Operators.



Especially Adapted to Manual Training Schools.

Buffalo Special Stationary Blast Forge,

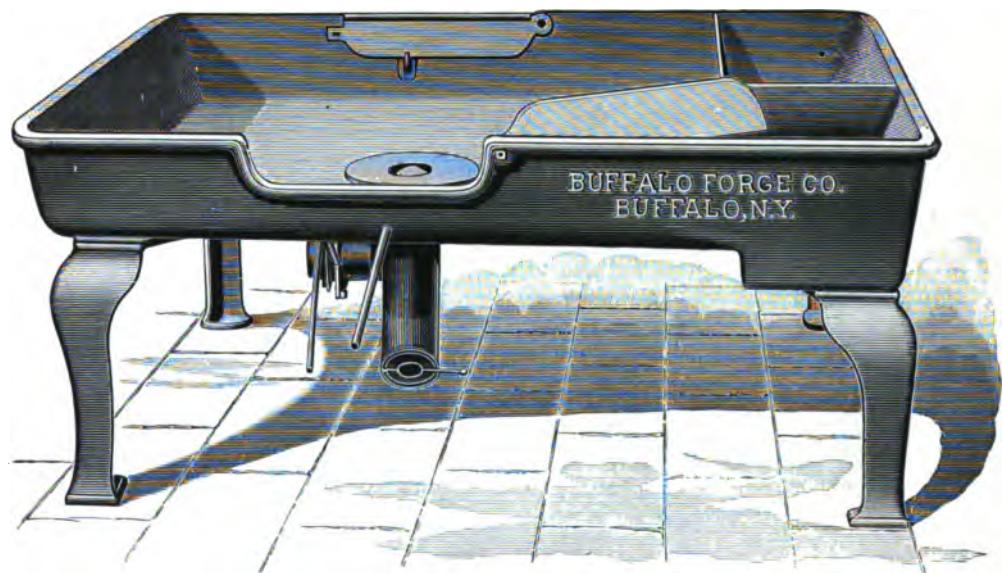
Designed for Two Operators.



Adapted to Technical Schools, Experimental Purposes, Etc.

Buffalo Stationary Blast Forge,

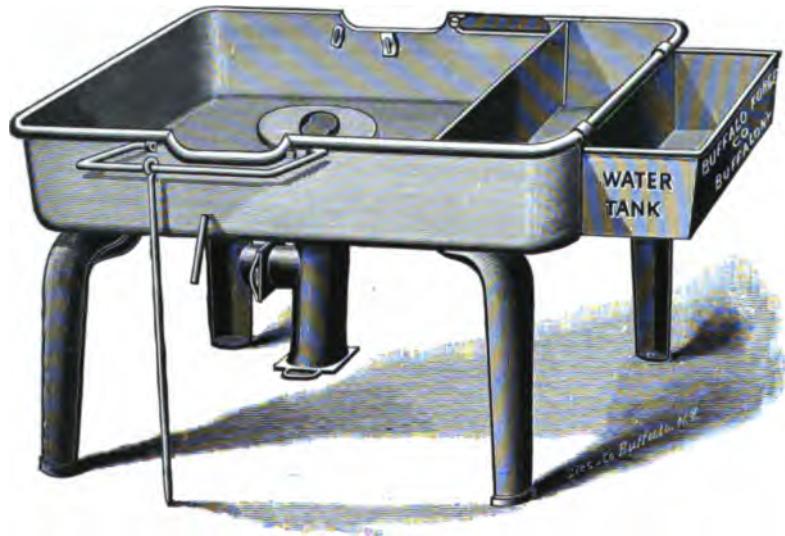
Adapted to Extra Heavy Work.



Stationary Blast Forge No. 03.

Buffalo Stationary Blast Forge,

Adapted to Heavy Work.



Stationary Blast Forge No. 00S.

Buffalo Stationary Blast Forge,

Adapted to Carriage and Wagon Shops.



Stationary Blast Forge No. 02.

Buffalo Stationary Blast Forge,

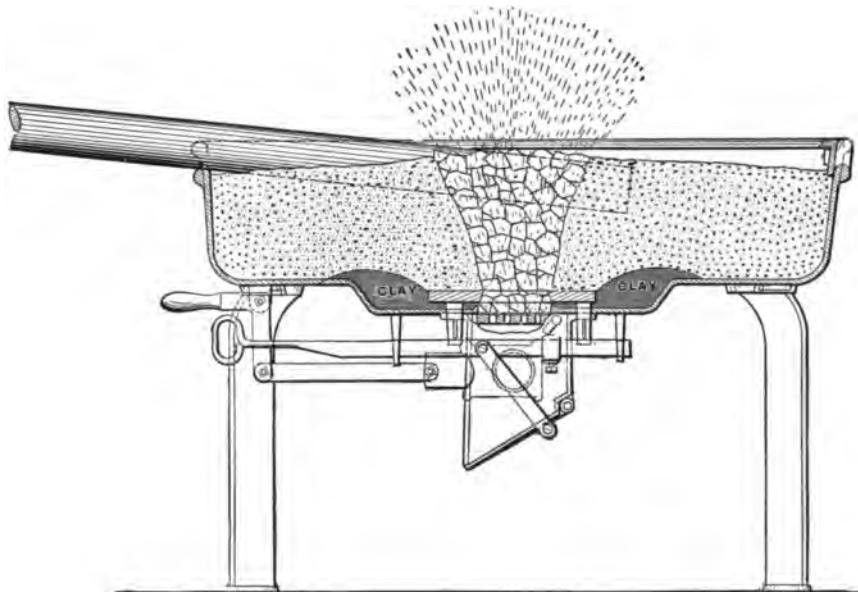
Adapted to Moderate Work.



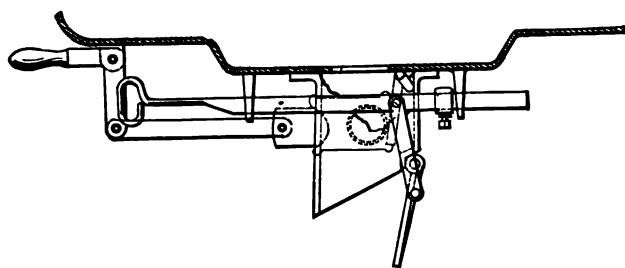
Stationary Blast Forge No. oS.

Buffalo Patented Anti-clinker Dumping Tuyere,

Used Exclusively on Buffalo Stationary Blast Forges.



Detail Fig. 1.



Detail Fig. 2.

Buffalo Portable Power Forges,

With Belted Blowers.

MANY small manufactories are without the accessory of a blacksmith shop usually common to large iron-working industries, yet there is as much necessity for a forge in one instance as in the other. In the former, as the shops are generally supplied with power, it is more desirable to have a forge arranged with a small fan as a part of it, to which power may be transmitted from the main shaft. Even in the largest iron works it is very convenient to have at least one of either of the two designs illustrated on the following pages, distributed at convenient intervals, for sharpening tools, tempering, etc. A sufficient number of forges to make it economical to employ an independent blower to supply the blast, are not often required in the example of small machine shops. As will be seen in the cuts, each forge has its own blower immediately underneath and communicating directly with the fire.

Power Forges No. 01 and No. 1 are especially designed and adapted for machine shops, and under a great variety of work will save the labor of a helper.

BUFFALO POWER FORGE NO. 0.—This machine is supplied with a 14-inch fan, and has sufficient capacity for heaviest work. It is built complete with tight and loose pulleys, also cut-off for the blast, by which the fire can be regulated to any degree. The forge can also be furnished with a hand power attachment for use at times when steam power is not available, making it a very complete machine.

BUFFALO MACHINISTS' POWER FORGE NO. 1.—This machine has a fan 10 inches in diameter, and is intended for lighter work than the one above described. It may be furnished with hand power attachment, if desired, and it is also built with tight and loose pulleys. A cut-off valve for the blast is provided, which permits of its instantaneous and perfect regulation. The forge is especially adapted for machinists' use, and like all other Buffalo Forges and Blowers, is unequaled in construction or design.

BUFFALO EXPERIMENTAL BLOWER.—This blower is made upon the same principle as Buffalo Steel Pressure Blowers, but is not so highly finished or as durable a machine. They operate perfectly noiseless, and will yield as large a volume of air in proportion to the sizes as the other types, but will not produce the same amount of pressure. These small blowers are intended especially for blowing-fires in portable and small stationary boilers for experimenting and various purposes where a small quantity of air at an average pressure is desired. The No. 0 is sufficient to blow one forge fire; No. $\frac{1}{2}$ is sufficient for three forge fires of average size. These small blowers may be also arranged for exhausting purposes at a small extra price.

BUFFALO POWER FORGES.

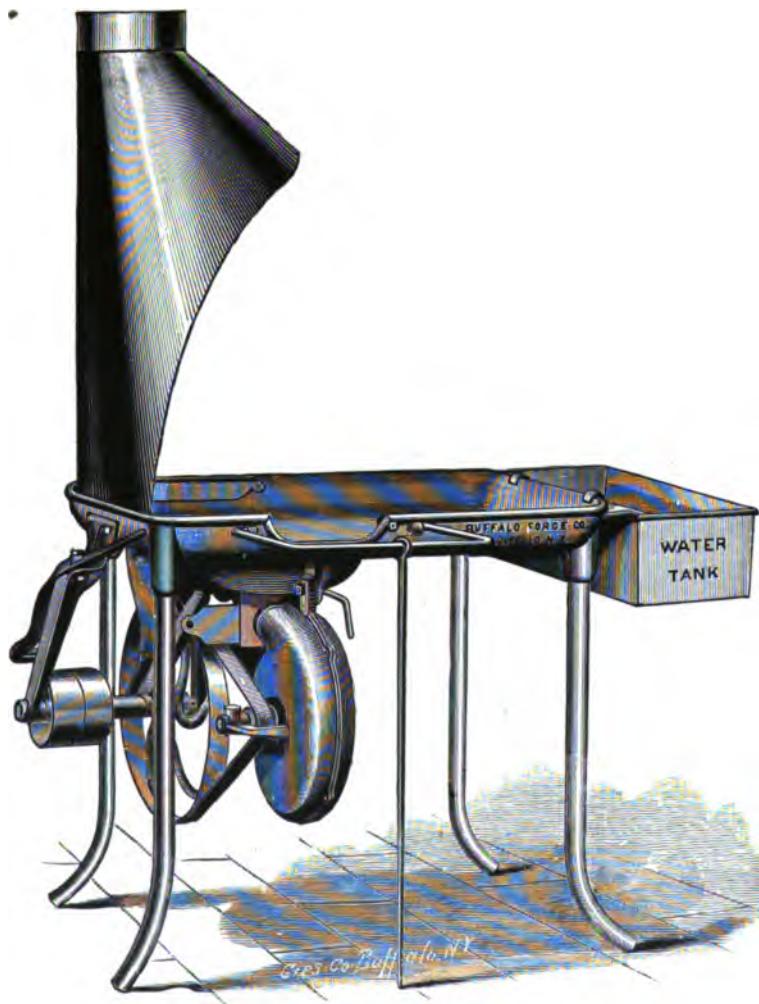
NAME OF FORGE	DIMENSIONS IN INCHES					WEIGHT	PRICE			
	Size of Fan	Size of Fire Pan	Water Tank				Without Water Tank	With Water Tank	With Hand Power Attachment, No Tank	With Hand Power Attachment and Water Tank
	Length	Width	Depth							
Power 0	14	28 x 50	23 $\frac{1}{4}$	9	6 $\frac{1}{2}$	250 lbs.	\$54.00	\$58.00	\$58.00	\$62.00
" 1	10	31 x 27				150 "	45.00	45.00	45.00	

BUFFALO EXPERIMENTAL BLOWERS AND EXHAUSTERS.

NUMBER	OUTSIDE DIA. OF OUTLET	HEIGHT	WEIGHT	PULLEYS		PRICE	
				Diameter	Face	For Blower	For Exhauster
00	2 $\frac{3}{4}$	8 in.	20 lbs.	1 $\frac{1}{2}$	1 $\frac{1}{2}$	\$ 8.00	\$10.00
0	3	12 "	30 "	1 $\frac{1}{2}$	1 $\frac{1}{2}$	10.00	12.00
$\frac{1}{2}$	4 $\frac{1}{2}$	18 "	45 "	1 $\frac{1}{2}$	2	14.00	16.00

Buffalo Portable Power Forge,

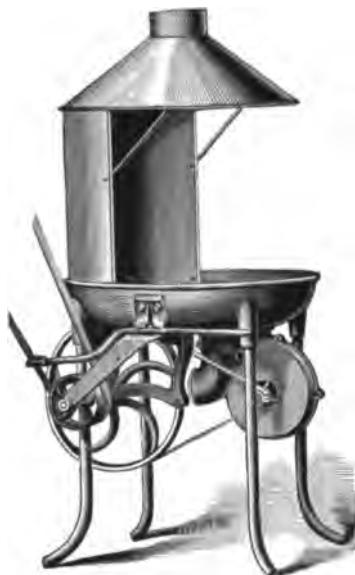
Suitable for General Shop Work.



Power Forge No. 0.

Buffalo Portable Power Forge,

Adapted for Machine Shops.



Power Forge No. 1.

Buffalo Experimental Blower.



Buffalo Small Blower No. 00.

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Buffalo Heating Forges,

For Hard Coal and Coke.

NINE regular designs of these machines are built by this house, and are priced below. Only three illustrations are herewith presented, for the reason that the other forges are similar in appearance and construction, and only varied for increased capacity. Buffalo Heating Forges are designed for heating a great variety of work, such as: rivets, bolts, rods, axes, hammers, hatchets, band iron, etc., and also for cutting, bending, forming and forging purposes. They are especially adapted to heating a number of pieces at one time, thus keeping the mechanic fully supplied with heated work to be operated upon continuously. They will be found especially advantageous for use in connection with steam hammers, steam and hydraulic riveting machines, etc. All have double shaking grates, with a blast gate for regulating the supply of blast.

Buffalo Heating Forges can be furnished so arranged as to suit various kinds of work. Nos. 32, 33, 34, 35, 36 and 37 are made with openings on one or both sides, and with the coal shute on one or both ends, as desired. They are also built with openings on one or both ends, and with the coal shute on one or both sides. Nos. 32 and 33 are constructed with openings on both ends, making a very desirable double forge for short light work. Heating Forge No. 35 is especially adapted for heating axes, hatchets, hammers and similar tools. It has a long narrow fireplace, and is very economical of fuel. No. 37 has an 8-inch space above fire, a total height of 16 inches from grate to end and inside of brick, and is designed for especially large work. In ordering or making inquiries, always state plainly the size and style desired, and in what manner it is desired to use the forge. Send a full description of the work to be performed. The efficiency and economy of these forges are fully guaranteed. We can furnish special sizes and styles upon short notice, at moderate cost.

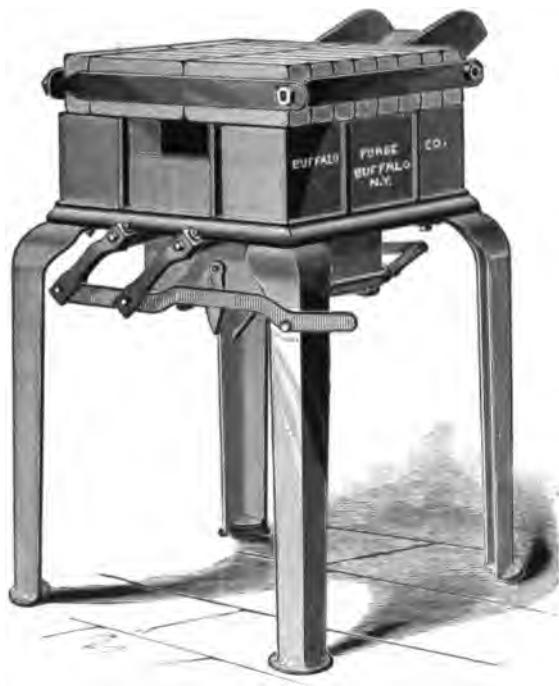
Several Special Buffalo Heating Forges have been designed for particular work, and cuts, with full description and prices, may be had upon application. We do not consume space herewith for illustrating same, as the demand for special construction or capacities greater than those below mentioned is infrequent. We will cheerfully forward names of users, etc., who have peculiar types of Buffalo Heating Forges in use.

PRICE LIST, SIZES AND DIMENSIONS.

No.		SIZE	PRICE
30	Complete without Brick, Grate Surface	8 x 10	\$ 35.00
31	" " " "	12 x 12	45.00
32	" " " "	13½ x 22	60.00
33	" " " "	12 x 20	60.00
34	" " " "	12 x 44	75.00
35	" " " "	8 x 22	55.00
36	" " " "	18 x 40	90.00
37	" " " "	18 x 40	110.00
38	" " " "	24 x 24	75.00

Buffalo Heating Forge,

For Hard Coal or Coke.



Heating Forge No. 31.

Buffalo Stationary Blast Heating Forge,
For Hard Coal or Coke.



Heating Forge No. 32.

Buffalo Stationary Blast Heating Forge,

For Hard Coal or Coke.



Heating Forge No. 34, with Four Grates.

Buffalo Portable Forges.

"AS THE result of unequaled merit and the universal progress in metal-working industries, Buffalo Forges have, undoubtedly, become as well known to every mechanic as any tool before the public." The above repetition from the introduction of this catalogue is a suitable prelude to the detailed description of these machines which follows. Their unparalleled success is largely due to the fact that each machine sent out is a prominent advertisement of the merits of the goods. The combination of conscientious construction and best material could have no other result. As an illustration of the growth of this department of our business, and of how the construction of these machines has been brought down to a fine point, it will be interesting to know that for sometime after the design of the first blacksmith forge was perfected, it was considered a good week's work to build and ship two forges. At the present date, five hundred machines can, with the greatest ease, be turned out and shipped in this time, without in any way retarding the operations in the other departments of our works. They are not only present in nine out of every ten blacksmith shops in America where an improved forge is used, but are to be found in every country on the globe.

Every Buffalo Forge is sold upon its merits and guaranteed to give entire satisfaction. The best steel shafts are used on all, and those furnished with hoods have the metal work built of heavy steel plate, which is more durable than sheet iron. All running gear is heavy, strong and easily operated. The blowers are of the same excellent construction as the regular Buffalo Steel Pressure Blowers having babbitted journal boxes. A stronger blast is secured from the fan attached to the forge than from any other. There is no dead center or back motion in the Buffalo Portable Forge, which is an element of all other machines, and they have an easy motion of operating by the levers, which does not confine the operator close to the fire, as all others do.

BUFFALO BLACKSMITHS' FORGE NO. 0.—As the name indicates, this is especially adapted for blacksmiths. Every progressive smith and metal worker in the country will readily appreciate the great superiority of these machines to the bellows and the brick forge. It heats quicker with less labor, the initial cost is less, and the durability and reliability exceed in every respect. Much room, time, labor and money are saved. The forge is guaranteed to produce a welding heat on 3-inch iron in five minutes; on 4-inch in ten minutes; its equal has not yet been produced.

BUFFALO MACHINISTS' FORGE NO. 1.—This is a half-open hood, and is guaranteed to yield a welding heat on 2½ and 3-inch iron in from five to ten minutes; it will do heavier work if required. For all kinds of tool work, for machinists, plumbers, miners, marble works, millers, railroad repair shops, locksmiths, planters and repairs for manufactories in general, it possesses unexcelled merit.

BUFFALO MACHINISTS' FORGE NO. 2.—This is built with a closed hood, completely enclosing the fireplace, with a large sliding door in front and a small one in the rear, for manipulating the fire. The use of the closed hood prevents the escape of sparks, smoke and fumes, and especially adapts this forge for planing mills, wood-working establishments in general, oil refineries, sugar works, varnish works, jewelers, locksmiths, and also for annealing and refining metals.

BUFFALO BOILER MAKERS' FORGE NO. 3.—No boiler shop is completely equipped without one or more forges of this design. It is also suitable for the use of iron bridge and ship builders, railroad contractors, and for general outdoor work. As will be observed by reference to the cut, four swing handles are provided for convenience of moving the forge from place to place. The deep fireplace peculiarly fits this forge for heating rivets, and its capacity is guaranteed sufficient for one boy to supply from three to four gangs of riveters.

BUFFALO TOOL MAKERS' FORGE NO. 4 is furnished with half-open hood. It will produce a welding heat on iron 1½ inches in diameter in five minutes, and also handle heavier work if required. They are especially recommended for the service specified on account of the size of the fireplace. Die sinkers, metal and tool makers, wood-working houses, locksmiths and jewelers find this forge invaluable for heating and tempering tools of all kinds.

Buffalo Portable Forges.

(CONTINUED.)

BUFFALO RIVET FORGE NO. 5.—The capacity of this forge is the same as the No. 4, and it is especially suitable for tank builders, elevated railroad contractors, repair work on boilers, bridges, etc. The forge is very light, strong and compact, and may be very easily carried about the country.

BUFFALO JEWELERS' FORGE NO. 6.—This machine is identical in construction, capacity and design with the No. 4, with the exception it has a closed hood with a large sliding door, preventing the escape of sparks, fumes or smoke when starting the fire. It is especially adapted for jewelers, cabinet makers, plumbers, and for heating and tempering tools in manufactures where combustible matter is a basis.

BUFFALO BENCH FORGE NO. 7.—A wooden case is furnished with this forge, where desired, 19 x 19 x 19 inches, weighing about 15 lbs. The machine is intended for light work only. It can be easily moved about, as the weight is reduced to a minimum. It has short legs, so that when used it is intended to be set on a box or bench. It will produce a welding heat on 1-inch iron in ten minutes. The machine is well adapted for miners and prospectors, and the case has room for carrying the usual tools.

BUFFALO BENCH FORGE NO. 8.—This forge has a half-open hood, and is of the same capacity as the No. 7. It is especially adapted for farmers, tinsmiths, locksmiths, etc. The former find it a very valuable tool, as it enables them to make many of their small repairs, saving time and money.

BUFFALO BENCH FORGE NO. 9.—This machine is identically the same as the No. 8, with the exception of its having an entirely closed hood, with a large double door in front and single door in rear, so that it may be opened at both points if desired. It is especially adapted for charcoal fires, as the closed hood prevents the escape of sparks, smoke, etc., when starting.

BUFFALO RAILROAD AND BRIDGE BUILDERS' FORGE NO. 10.—This machine is especially adapted for railroad repair work, iron bridge and tank builders. The capacity is the same as the No. 5 Forge.

BUFFALO MINERS' AND PROSPECTORS' FORGE NO. 11.—The construction and design of this machine are identically the same as the No. 5 Forge, but the machine has shorter legs, to the end of rendering it more compact for transportation, and is recommended in preference to the No. 7 for prospecting purposes, as it has greater capacity and permits a greater variety of work to be done in less time, with less labor. With case, the weight is but 60 lbs., and there is always ample room for a full line of tools.

BUFFALO BUILDERS' FORGE (BELLOWS TYPE) NO. 12.—For all repair work in railroad, bridge, tank and other building, where a forge is required, this machine is unrivaled in efficiency and durability. The moving parts of the forge are protected by an iron drum, practically of the same construction as shown in wood cut No. 10, and there is no danger of breakage while being transported around the country. For supplying blast, a bellows is employed, instead of the usual iron fan. Users who have employed both, invariably prefer this type.

PRICE LIST, SIZES AND DIMENSIONS.

NO. OF FORGE	HEIGHT	SIZE OF HEARTH	DIAM. OF FAN	WEIGHT		PRICE	
				Without Tank	With Tank	Without Tank	With Tank
0	30 in.	28 x 40 in.	14 in.	250 lbs.	300 lbs.	\$50.00	\$54.00
1	29 "	21 x 27 "	10 "	140 "		40.00	
2	29 "	21 x 27 "	10 "	150 "		42.00	
3	29 "	21 x 27 "	10 "	140 "		36.00	
4	33 "	18 in. diam.	6 "	75 "		27.00	
5	33 "	18 " " "	6 "	70 "		24.00	
6	33 "	18 " " "	6 "	80 "		30.00	
7	15 "	15 " " "	6 "	40 "		16.00	
8	15 "	15 " " "	6 "	50 "		18.00	
9	15 "	15 " " "	6 "	55 "		20.00	
10	32 "	18 " " "	6 "	110 "		32.00	
11	17½ "	18 " " "	6 "		60 lbs.		\$26.00
12	30 "	19 " " "		125 "		32.00	

Buffalo Blacksmiths' Portable Forge,

With Sheet Steel Hood.



Hand Forge No. o.

Buffalo Machinists' Portable Forge,

With Half Open Hood.



Hand Forge No. 1.

Buffalo Machinists' Portable Forge,

With Closed Hood.



Hand Forge No. 2.

Buffalo Boiler Makers' Portable Forge,

Without Hood.



Hand Forge No. 3.

Buffalo Tool Makers' Portable Forge,

With Half Open Hood.



Hand Forge No. 4.

Buffalo Riveters' Portable Forge,

Without Hood.



Hand Forge No. 5.

Buffalo Jewelers' Portable Forge,

With Closed Hood.



Hand Forge No. 6.

Buffalo Bench Portable Forges,

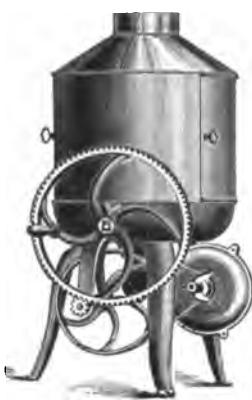
For Jewelers, Dentists, Miners, Farmers, Etc.



Hand Forge No. 7.



Hand Forge No. 8.



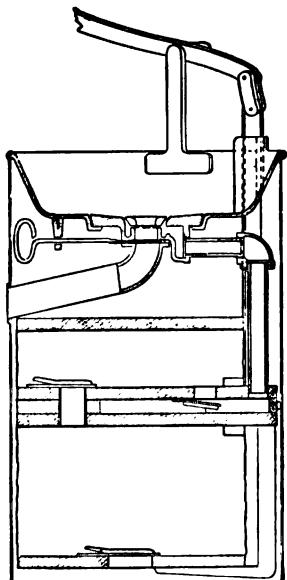
Hand Forge No. 9.



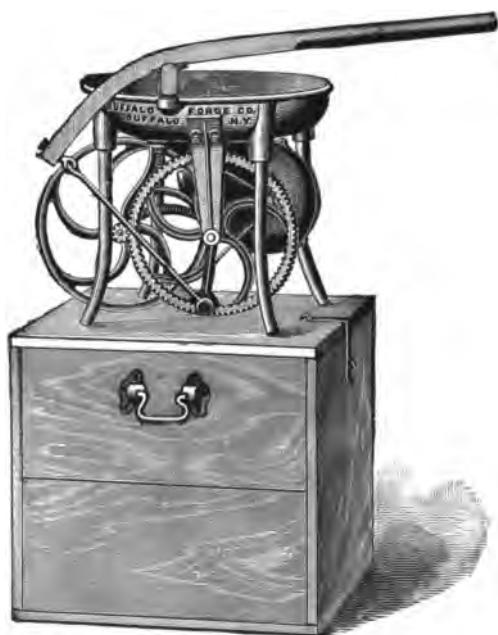
Hand Forge No. 10.

Buffalo Miners' and Builders' Portable Forges,

For Prospectors and Railroad Builders.



Bellows Forge No. 12.



Hand Forge No. 11, with Case.

Buffalo Blacksmiths' Hand Blowers,

For Use in Connection with Brick Forges.

MANY blacksmiths, either through prejudice or from experience gained in the use of forges other than the genuine "Buffalo," believe nothing can ever equal the old-fashioned brick type, and not being pressed for room, still cling to it. A goodly number of such smiths have made one advancement in substituting the hand blower for supplying the blast for the old-time bellows. This has been brought about by a most forcible argument, to wit: the comparative ease with which a fire may be blown as when operated with leather bellows. This house has always supplied these machines with the distinct understanding that entire satisfaction is fully guaranteed or money refunded. Undoubtedly, the Buffalo Hand Blowers have been brought into such prominence through this method of selling. Any observer who visits a dozen blacksmith shops throughout the country, will readily find that in nine cases out of ten, where either a portable forge or a hand blower is employed, it will be a Buffalo. Users who seek for efficiency at low cost should not confound these with the cheap imitations frequently offered.

BUFFALO HAND BLOWER NO. 3.—This is termed the "Buffalo Standard" type of hand blower, and is most largely employed in blacksmith shops. It is built right or left hand, and furnished with or without tuyere, as desired. Without question, fourfold more No. 3 Buffalo Standard Hand Blowers are in daily use in general blacksmith shops throughout the country, than any of the other types. The sale is not confined to America, but there is scarcely a foreign country in which they are not great favorites.

BUFFALO HAND BLOWER NO. 5.—This machine is designed to meet the requirements where, for convenience, a crank blower is desirable. In its construction, we have embodied our patented ratchet crank, which does not continue to revolve when released by the operator, but falls in the position indicated in the cut, which is the most convenient for starting the blower. The gears are properly proportioned to give the required speed to fan at a slow crank motion, and with the least loss of power by friction. At 30 turns of crank per minute, this size will blow strong enough to heat 3 to 4-inch iron in from five to ten minutes. Furnished with or without tuyere.

BUFFALO BLACKSMITHS' HAND BLOWER NO. 4.—This is the largest hand blower made in the world, and is especially designed for flange fires in boiler shops, and extra heavy work in shipsmiths' shops, as it will perform heavier work than any other hand blower built. Furnished with or without tuyere.

BUFFALO BLACKSMITHS' HAND BLOWER NO. 2.—This is similar in design to the illustration of the No. 4, and is especially adapted for all blacksmith purposes, producing a welding heat on 3-inch iron in five minutes and on 4-inch iron in ten minutes. Heavier work can be accomplished, if required. Furnished with or without tuyere.

PRICE LIST, SIZES AND DIMENSIONS.

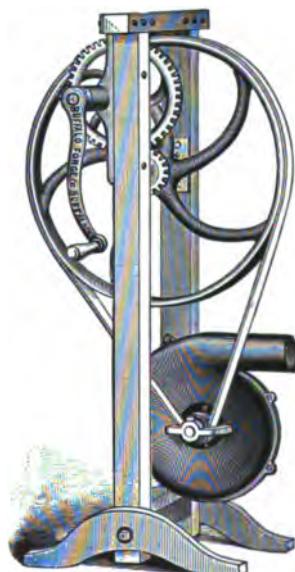
NUMBER OF HAND BLOWER	DIMENSIONS			WEIGHT		PRICE	
	Height	Length	Size of Fan	Without Tuyere	With Tuyere	Without Tuyere	With Tuyere
2	35 in.	32 in.	14 in.	130 lbs.	150 lbs.	\$30.00	\$32.00
3	47 "	28 "	14 "	117 "	135 "	23.00	25.00
4	35 "	35 "	17 "	175 "	190 "	34.00	36.00
5	47 "	28 "	14 "	110 "	128 "	18.00	20.00

Buffalo Blacksmiths' Hand Blowers,

With or Without Tuyeres.



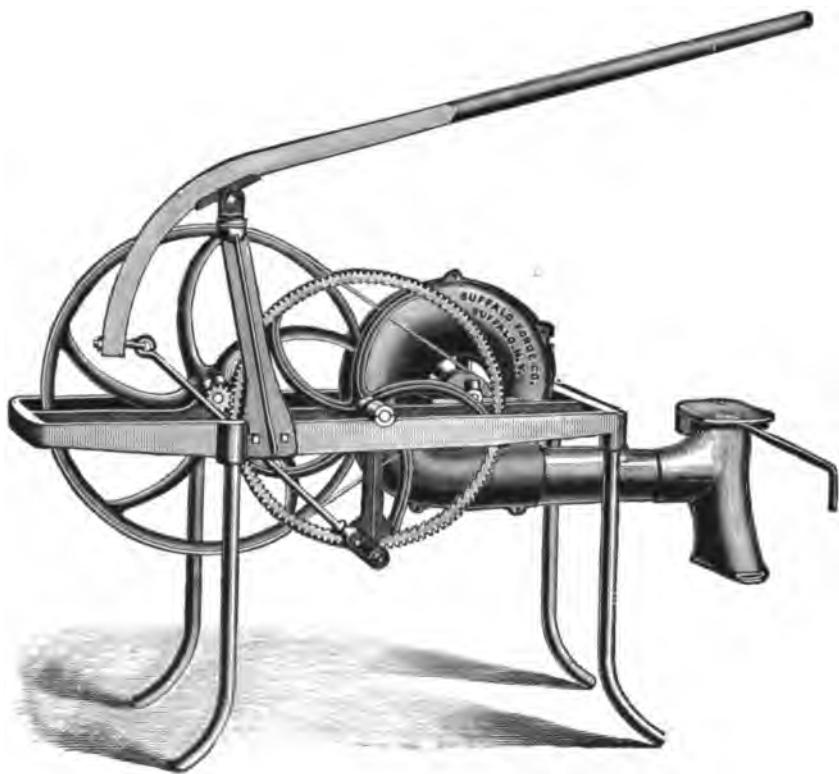
Hand Blower No. 3.
Made for Right or Left Hand.



Hand Blower No. 5.

Buffalo Blacksmiths' Hand Blower,

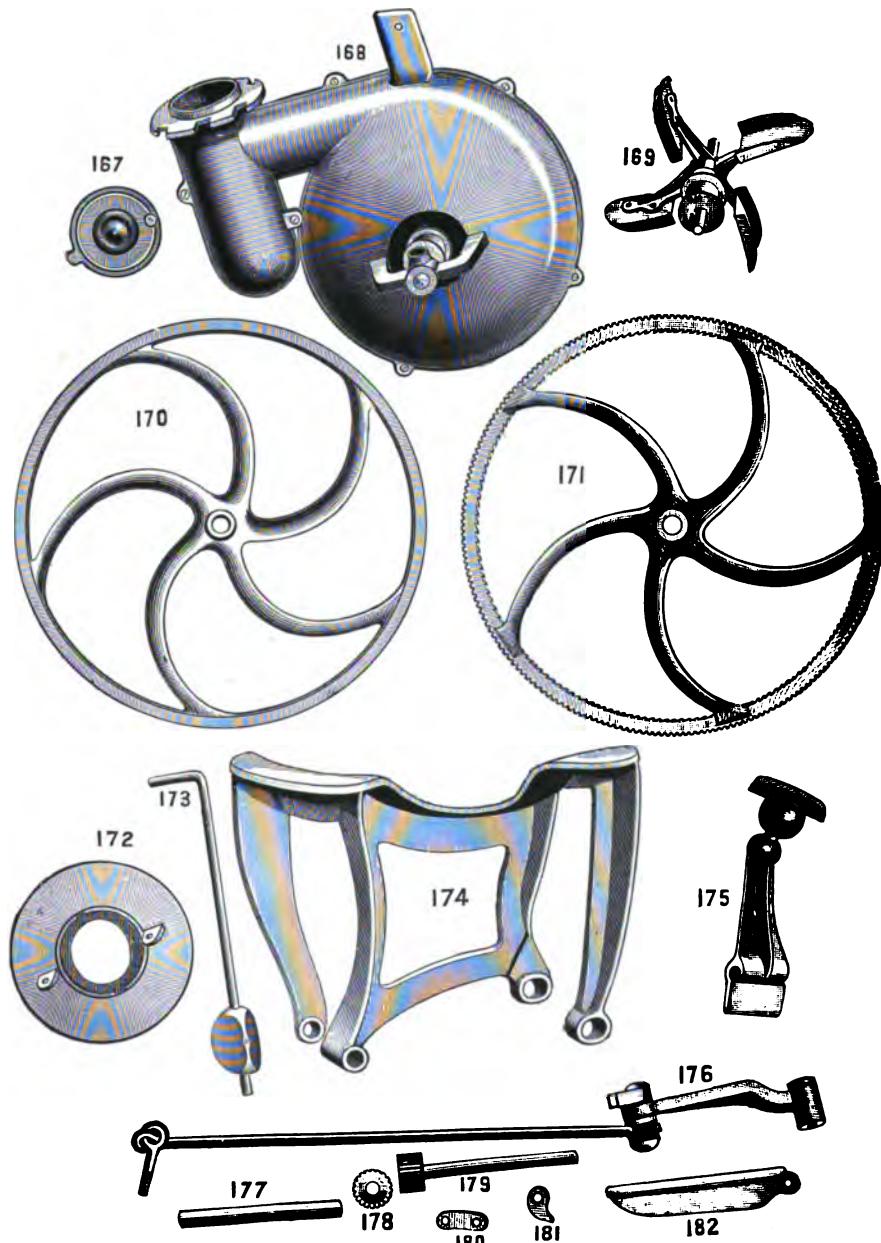
Furnished With or Without Tuyere.



Hand Blower No. 4, With Tuyere.

Buffalo Portable Hand Forges,

Duplicate Parts No. 0.

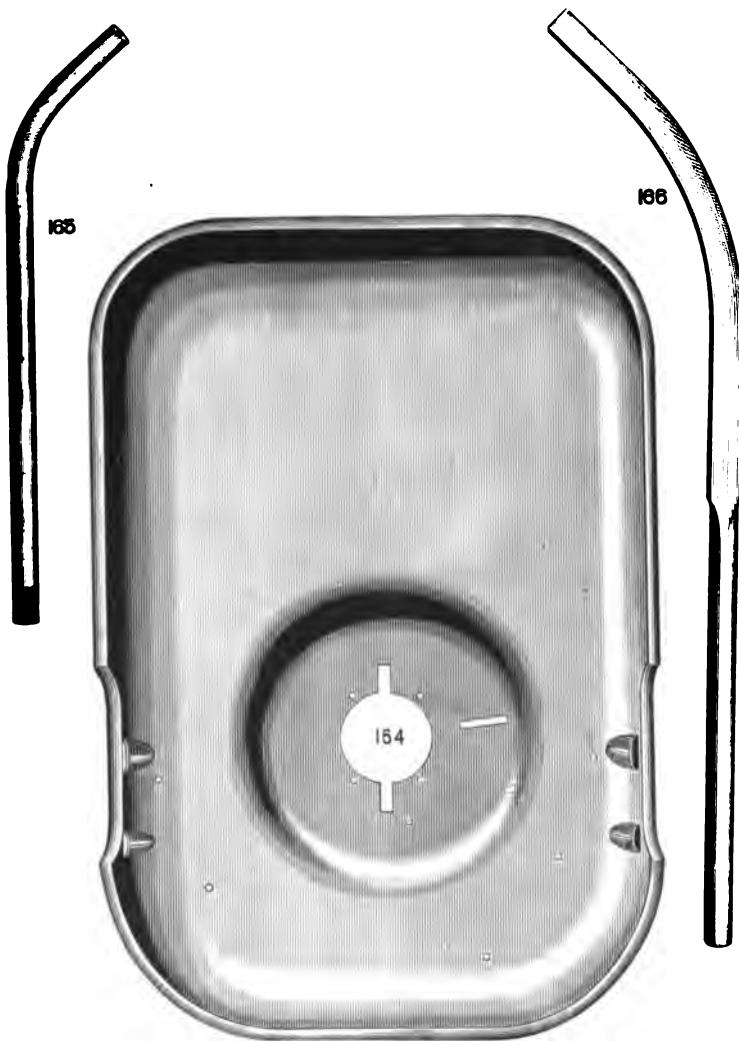


For Price List, See Page 261.

Buffalo Portable Hand Forges,

Duplicate Parts No. 0.

(CONTINUED.)

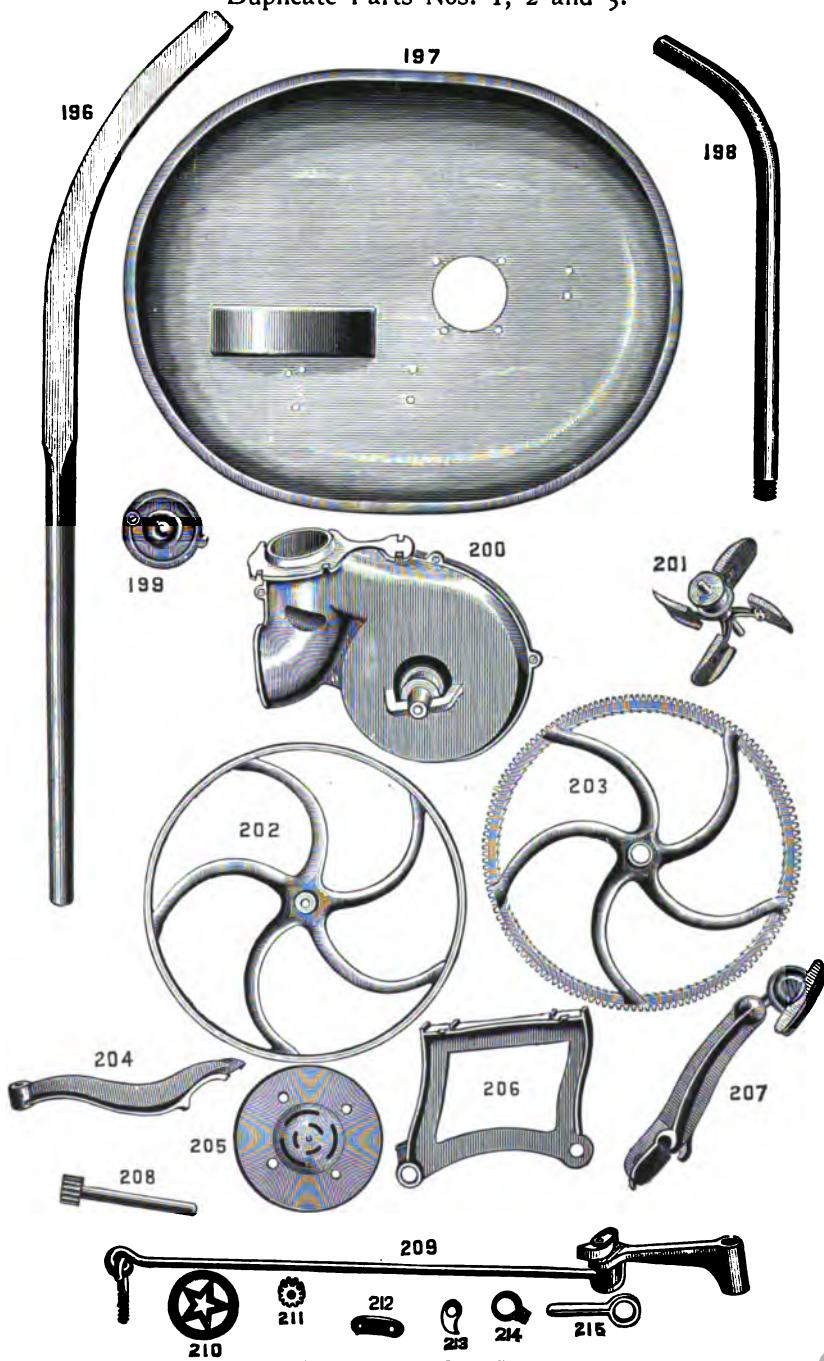


For Price List, See Page 261.

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Buffalo Portable Hand Forges,

Duplicate Parts Nos. 1, 2 and 3.

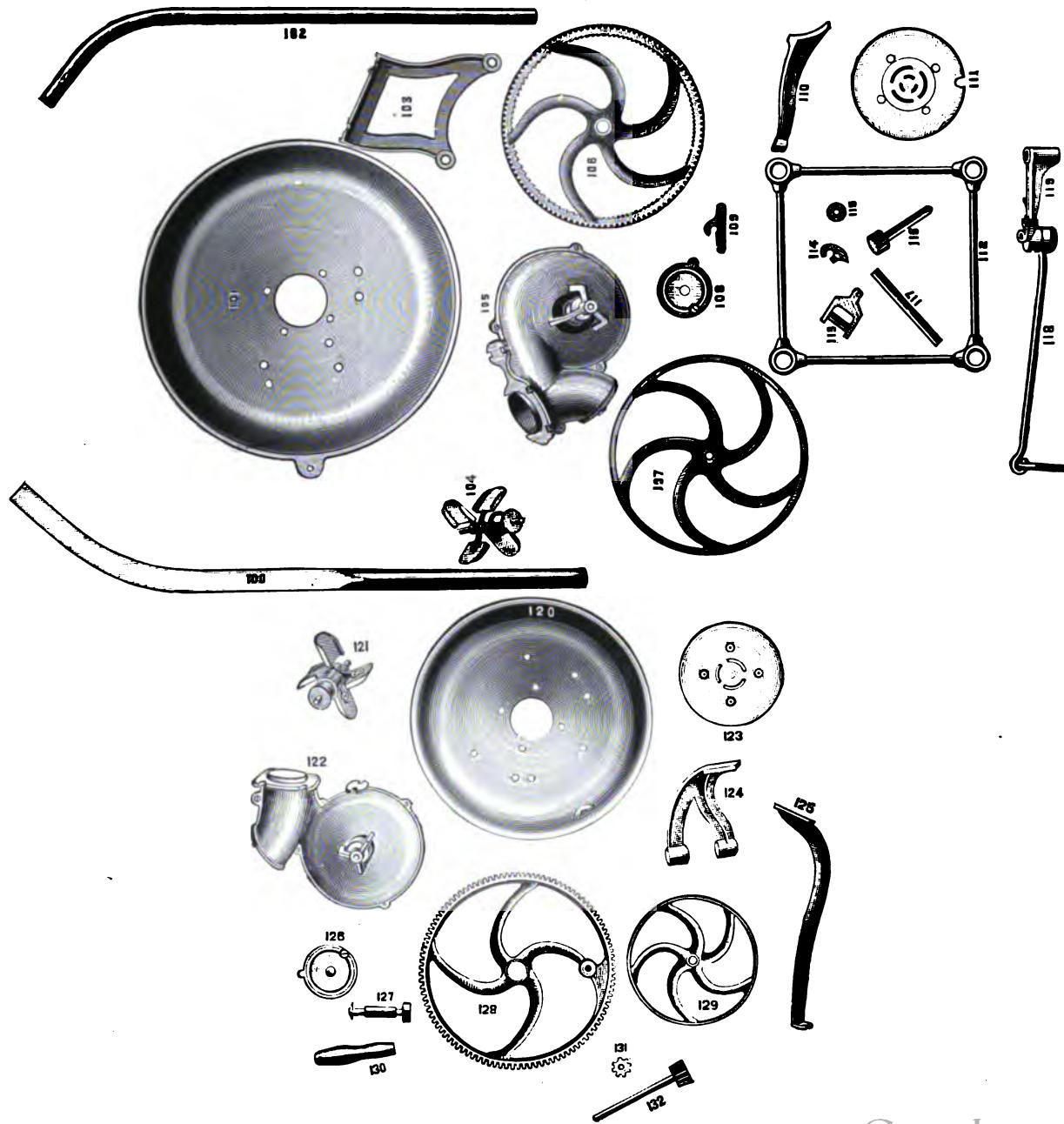


For Price List, See Page 261.

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Buffalo Portable Hand Forges,

Duplicate Parts Nos. 4, 5, 6, 10 and 11.



For Price List, See Page 262.

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Buffalo Portable Hand Forges,

Telegraph Code for Duplicate Parts.

FOR the convenience of dealers and others who order by wire, we append a "Telegraph Code for Duplicate Parts" corresponding to the numbers of such illustrated. In ordering simply give the cipher and the part will be sent from stock. The prices attached are net—positively no discount to any one.

BLACKSMITH FORCE NO. O.

TELEGRAPH CIPHER	No.	DESCRIPTION	NET PRICE
Balsam		Sheet Iron Hood.....	\$1.50
Best	164	Hearth or Fire Pan .....	.60
Betray	165	Wrought Iron Leg.....	.40
Bible	166	Wooden Handle or Lever .....	.30
Bid	167	Ash Pit Cover.....	.10
Bigot	168	Fan Case and Spider, complete.....	.35
Blind	169	Fan, Spider, Shaft and Pulley.....	1.25
Birch	170	Main Band Wheel.....	1.00
Birth	171	Main Gear and Ratchet Wheel.....	1.75
Bison	172	Tuyere Plate.....	.40
Bite	173	Tuyere Valve .....	.20
Blab	174	Main Hanging Bracket.....	2.50
Black	175	Upright Arm and Swivel.....	.75
Blade	176	Swinging Arbor Pawl and Lever Rod.....	1.25
Blame	177	Shaft for Large Gear.....	.25
Blast	178	Pinion or Small Gear.....	.30
Blaze	179	Pinion and Shaft.....	.50
Blend	180	Pawl Plate.....	.10
Bloat	181	Pawl .....	.10
Block	182	Swinging Gate .....	.10

PORTABLE FORGES NOS. 1, 2 AND 3.

TELEGRAPH CIPHER	No.	DESCRIPTION	NET PRICE
Camel	195	Main Band Wheel or Pulley.....	\$1.50
Cabinet		Sheet Iron Hood, No. 1.....	.50
Cablet		Sheet Iron Hood, No. 2.....	1.75
Camp	196	Wooden Lever.....	.25
Can	197	Hearth or Fire Pan.....	3.50
Canal	198	Iron Leg .....	.30
Cancel	199	Ash Pit Cover .....	.10
Cancer	200	Fan Case and Spider, complete.....	3.00
Candle	201	Fan, Spider, Shaft and Pulley.....	1.25
Candor	202	Main Band Wheel.....	1.00
Candy	203	Main Gear and Ratchet Wheel.....	1.25
Cairo	204	Side Bracket.....	.25
Canoe	205	Tuyere Plate .....	.30
Cant	206	Main Hanging Bracket.....	.75
Capon	207	Upright Arm and Swivel.....	.75
Captor	208	Pinion and Shaft.....	.40
Carat	209	Swinging Arbor and Lever Rod.....	1.00
Carbon	210	Oil Can Bracket .....	.10
Cadiz	211	Pinion or Small Gear.....	.25
Dab	{ 212	Pawl Plate.....	.10
Dace	213	Pawl .....	.10
Dam	214	Handle Washer.....	.10
	215	Swinging Handle ..	.10

Buffalo Portable Hand Forges,

Telegraph Code for Duplicate Parts.

CONTINUED.

PORTABLE FORGES NOS. 4, 5 AND 6.

TELEGRAPH CIPHER	No.	DESCRIPTION	NET PRICE
Ace		Sheet Iron Hood, No. 4.....	\$.75
Acid		Sheet Iron Hood, No. 6.....	1.00
Aback	100	Wooden Lever or Handle.....	.25
Abase	101	Hearth or Fire Pan.....	1.50
Abbott	102	Iron Leg .....	.20
Abed	103	Main Hanging Bracket .....	.50
Akron	104	Fan, Spider, Shaft and Pulley.....	.75
Albany	105	Fan Case, with Spider and Shaft, complete.....	2.50
Abject	106	Main Gear and Ratchet Wheel .....	.75
Abode	107	Main Pulley or Band Wheel.....	.50
Absent	108	Ash Pit Cover.....	.10
Absorb	109	Swivel Joint, attached to Lever.....	.10
Abuse	110	Side Bracket.....	.25
Accord	111	Tuyere Plate.....	.25
Back	112	Braces .....	.50
Bacon	113	Swivel Joint, attached to Fire Pan.....	.20
Badge	114	Pawl .....	.10
Bag	115	Pinion or Small Gear.....	.25
Bail	116	Pinion and Shaft .....	.35
Ballad	117	Shaft for Main Gear Wheel.....	.15
Ballot	118		
Balter	119	}	
		Swinging Arbor and Lever Rod.....	.75

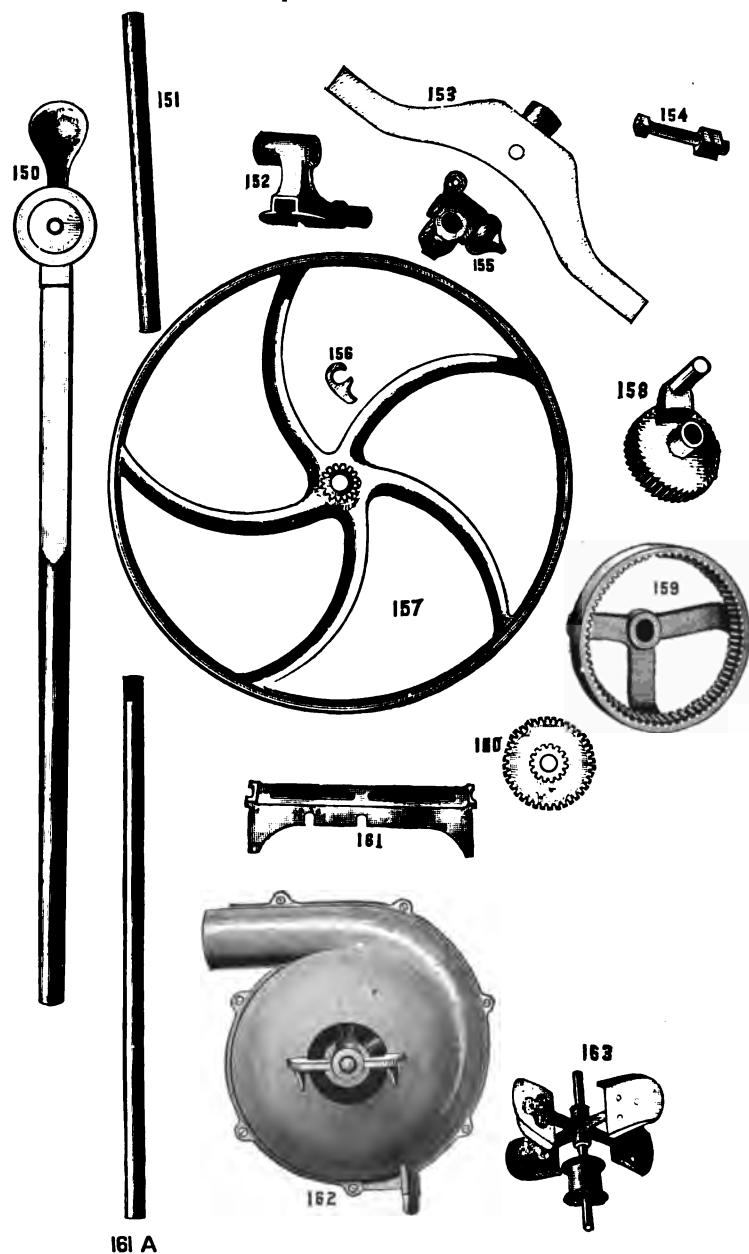
PORTABLE FORGES NOS. 7, 8, 9, 10 AND 11.

TELEGRAPH CIPHER	No.	DESCRIPTION	NET PRICE
Bandit		Sheet Iron Hood, No. 8.....	\$.50
Bamboo		Sheet Iron Hood, No. 9.....	.75
Banish		Hearth or Fire Pan	1.00
Banker	120	Fan, Spider, Shaft and Pulley .....	.75
Baden	121	Fan Case, Spider, Shaft and Pulley, complete.....	2.00
Badley	122	Tuyere Plate.....	.25
Baltic	123	Main Hanging Bracket .....	.25
Bangor	124	Cast Leg.....	.25
Barb	125	Ash Pit Cover.....	.10
Barber	126	Gear Wheel Shaft .....	.20
Barge	127	Main Gear Wheel .....	.50
Baron	128	Main Pulley or Band Wheel.....	.50
Baring	129	Handle .....	.10
Barrel	130	Pinion or Small Gear .....	.25
Barton	131	Pinion and Shaft.....	.35
	132		

The prices for duplicate parts of the above are net—positively no discount. Forges 10 and 11 are practically the same as 4, 5 and 6, so that the same cipher may be used in ordering.

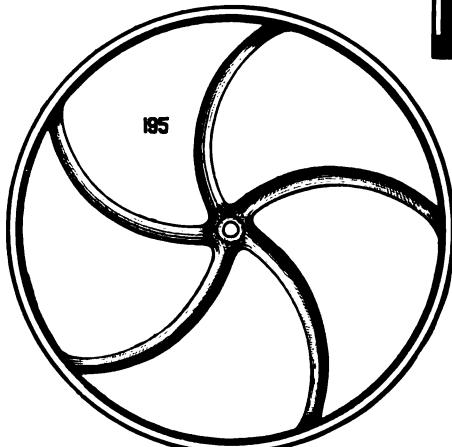
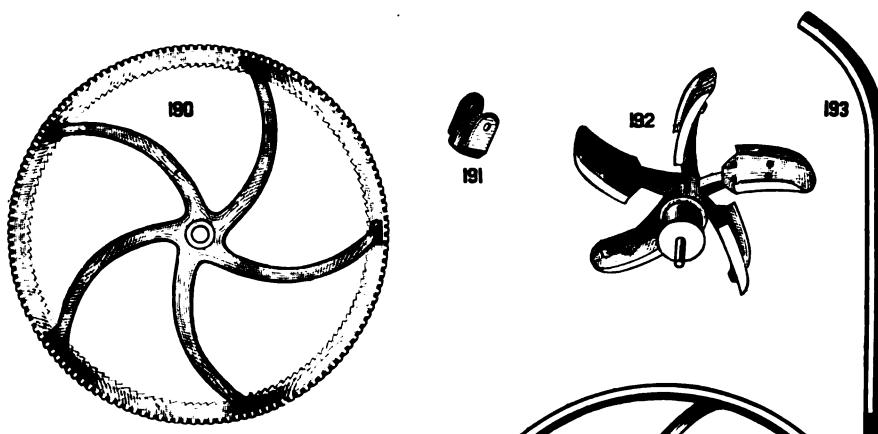
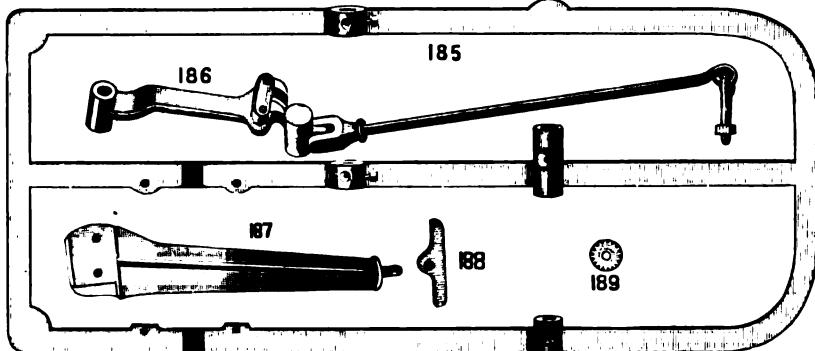
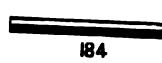
Buffalo Blacksmiths' Hand Blowers,

Duplicate Parts No. 01.



For Price List, See Page 267.

Buffalo Blacksmiths' Hand Blowers,
Duplicate Parts No. 4.



For Price List, See Page 268.

Buffalo Blacksmiths' Hand Blowers,

Telegraph Code for Duplicate Parts.

BLACKSMITH HAND BLOWER NO. 01.

TELEGRAPH CIPHER	No.	DESCRIPTION	NET PRICE
Beauty	150	Lever and Balance Weight.....	\$.65
Beck	151	Main Shaft .....	.25
Beckon	152	Lever Circle and Bearing.....	.45
Beef	153	Iron Leg or Stand.....	.50
Before	154	Lever Bolt.....	.10
Begin	155	Upright Box and Hanger.....	.30
Behold	156	Pawl .....	.10
Boston	157	Main Band Wheel ..'	1.75
Belch	158	Ratchet Gear .....	.75
Belfry	159	Internal Gear .....	.75
Below	160	Double Pinion or Gear.....	.50
Bench	161	Leg Brace .....	.35
Bend	162	Fan Case and Spider, complete.....	3.50
Berry	163	Fan, Spider, Shaft and Pulley	1.25
Beset	161A	Iron Pipe, upright.....	.25

BLACKSMITH HAND BLOWER NO. 2.

TELEGRAPH CIPHER	No.	DESCRIPTION	NET PRICE
Dandy	216	Lever Shoe	\$.20
Dash	217	Iron Frame	2.50
Delhi	218	Pinion or Gear.....	.30
Each	219	Main Gear Shaft.....	.30
Echo	220	Pinion and Shaft.....	.50
Egg	221	Upright Arm .....	.40
Eugene	222	Iron Leg.....	.30
Eden	223	Swinging Arbor and Lever Rod.....	1.25
Enter	224	Fan, Spider, Shaft and Pulley.....	1.25
Era	225	Pawl .....	.10
Gain	226	Pawl Plate.....	.10
Gage	227	Swivel Jaw .....	.20
Gala	228	Lever Bolt.....	.10
Hack	229	Main Band Wheel or Pulley	1.00
Hail	230	Main Gear Ratchet Wheel	1.75
Hair	231	Fan Case and Spider, complete.....	3.50
Harm	232	Wooden Lever or Handle .....	.30

The above are net prices—positively no discount.

Buffalo Blacksmiths' Hand Blowers,

Telegraph Code for Duplicate Parts.

CONTINUED.)

HAND BLOWER NO. 3.

TELEGRAPH CIPHER	No.	DESCRIPTION	NET PRICE
Barrow	133	Pawl Plate and Pawls	\$.30
Basalt	134	Lever Circle and Shaft.....	.75
Base	135	Pinion and Pawl Plate, complete.....	.75
Basin	136	Single Lower Box .....	.10
Basket	137	Upper and Lower Box.....	.25
Bastard	138	Pawl Plate.....	.10
Bastile	139	Pinion or Small Gear.....	.35
Batch	140	Upper Box, carrying Lever Shaft.....	.10
Bather	141	Segment or Half Gear.....	.75
Baton	142	Lever Balance Weight.....	.40
Batter	143	Lever Bolt.....	.10
Battle	144	Main Band Wheel or Pulley.....	1.75
Beach	145	Wooden Lever.....	.25
Beadle	146	Washer for Lever Shaft .....	.10
Beacon	147	Main Shaft .....	.25
Bead	148	Fan Case, Spider and Pulley, complete.....	3.50
Beast	149	Fan, Spider, Shaft and Pulley	1.25

HAND BLOWER NO. 4.

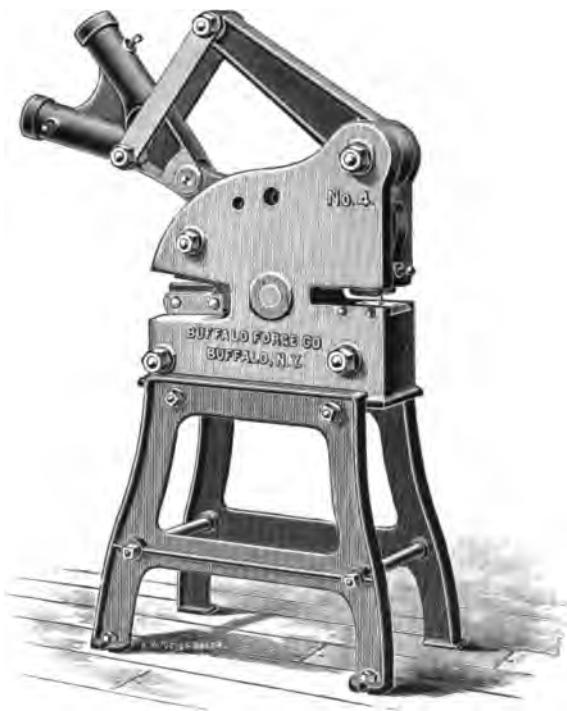
TELEGRAPH CIPHER	No.	DESCRIPTION	NET PRICE
Blue	183	Pinion and Shaft	\$.50
Bluff	184	Shaft for Large Gear.....	.25
Cab	185	Iron Frame	3.50
Cable	186	Swinging Arbor and Lever Rod.....	1.50
Caddy	187	Upright Arm .....	.50
Cadet	188	Upright Swivel Joint.....	.10
Cage	189	Pinion and Small Gear.....	.30
Calf	190	Main Gear and Ratchet Wheel	1.75
Cali	191	Swivel Jaw .....	.10
Call	192	Fan, Spider, Shaft and Pulley	1.75
Calin	193	Iron Leg .....	.30
Calix	194	Fan Case and Spider, complete.....	4.50

The above are net prices—positively no discount.

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Buffalo Punch, Shear and Bar Cutter,

For General Shop Use.



Combined Punch, Shear and Bar Cutter.

Buffalo Continuous Shear,

For Tinners and Sheet Iron Workers.



Continuous Shear.

Buffalo Punch, Shear and Bar Cutters,

For Blacksmiths and General Shop Work.

THESE tools are built and furnished in three forms, viz: Buffalo Combined Punch, Shear and Bar Cutter, Buffalo Continuous Shear, and Buffalo Independent Punch. The former is most suitable for blacksmith and general shop work, where use is found for a combined punching, shearing and cutting hand tool. The Continuous Shear is designed for tinners and sheet iron workers, being especially built for their requirements. The Independent Punch is likewise intended for special situations, or where a powerful hand punch is required.

In 1890 these machines were first placed upon the market. The universal satisfaction given is conclusive evidence that the end sought, i. e., a perfect tool, has been fully reached. Durability, compactness and power are so combined as to secure the acme of perfection. Those who have bought are enthusiastic. All machines are made with three-foot levers, with every part interchangeable, so that any detail may be furnished at once in the event of breakage, which, barring accidents and when handling work intended for power machines or greater than the listed capacity, will seldom occur. Repairs, if ever required, will be furnished, accurately fitted and finished.

The mechanism of this tool is unique. As will be observed, it consists in a combination of leverages so arranged that the cutting is done up from the bottom. This feature enables one man with this Improved Punch, Shear and Bar Cutter to perform a greater amount of work and easier than two using the old style down-cut machine, where the pressure comes against a heavy weight. In this machine, the designer has happily combined in one the work of three different machines: a punch, shear and bar cutter. The construction is such that the operator can work either without a helper—a point not embodied in like tools of other manufacture. These machines require no adjusting whatever in changing the work, being always ready to perform either of the three duties.

Every machine is guaranteed to do the work specified as its capacity in the following table, with ease, and to require no crowding to perform such service. Every machine sold is thoroughly tested to the work listed as its capacity before leaving our shop, and samples of such are sent with every shipment. The ease with which the work claimed may be performed is a surprise to many buyers, and oftentimes heavier work is attempted. The capacity table gives the greatest amount of work which it is desirable to handle with each size, and anything attempted above this must be at the risk of the purchaser, who should bear in mind that this is a hand tool and not a power machine.

Before offering to the public, the most severe tests were made for three years in various shops. This continuous use, together with the employment of the Buffalo Punch, Shear and Bar Cutter in the hundreds of shops where it has been installed since its introduction, would bring to light any defects in construction and design, if such existed.

PRICE LIST, SIZES AND DIMENSIONS.

NUMBER AND NAME	PUNCHES AND DIES FURNISHED	CAPACITIES			PRICE
		Shear	Punch	Cut-off	
Combined Punch, Shear and Bar Cutter,					
1	$\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$	$\frac{1}{4}$ in. strap iron, $1\frac{1}{2}$ in. wide	$\frac{1}{8}$ in. in $\frac{1}{8}$ in. iron	0 to $\frac{3}{8}$ in. round iron	\$ 40.00
2	" " "	$\frac{1}{8}$ "	$\frac{1}{4}$ "	" "	50.00
3	" " "	$\frac{1}{8}$ "	$\frac{3}{8}$ "	" "	70.00
4	" " "	$\frac{1}{8}$ "	$\frac{3}{8}$ "	" "	100.00
6	Continuous Shear,	0 to $\frac{1}{8}$ in. thickness	$\frac{1}{8}$ "	$\frac{1}{8}$ "	30.00
7	" "	0 "	$\frac{1}{8}$ "	" "	40.00
8	" "	0 "	$\frac{1}{8}$ "	" "	50.00
9	" "	0 "	$\frac{1}{8}$ "	" "	100.00
12	Independent Punch,	$\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$	$\frac{1}{8}$ in. in $\frac{1}{8}$ in. iron	" "	30.00
13	" "	$\frac{1}{8}$, $\frac{3}{8}$, $\frac{5}{8}$	" "	" "	40.00
14	" "	$\frac{1}{8}$, $\frac{3}{8}$, $\frac{5}{8}$	" "	" "	50.00
15	" "	$\frac{1}{8}$, $\frac{3}{8}$, $\frac{5}{8}$	" "	" "	60.00

Extra punches \$1.00 each, extra knives \$1.00 each, extra cutters \$1.00 per pair.

Buffalo Independent Punch,

For Boiler Makers and General Shops.



Independent Punch.

Buffalo Blacksmith Drills,

Upright Hand and Power Machines.

THE workmanship and material on all the drills described below are of the highest order. All shafts and screws are of the best steel; the gears are made from the most approved patterns, machine cut, and are unexcelled in smoothness of action; the bearings are solid, not babbitted, but bored out and reamed to gauges of cast iron, making most durable machines.

Both the Hand and Power machines which are fully illustrated by the cuts appearing on the following pages, as will readily be appreciated, are superior in design to any yet produced. The features which have characterized the unparalleled success of Buffalo Forges, viz.: the best of material, workmanship and design, have been embodied in the construction of Buffalo Drills, and they are fast being conceded to be unapproached in efficiency, ease of operating and general points which combine to make an efficient machine. A most thorough inspection and criticism is asked of intending customers. All sizes and types are kept constantly in stock, and can be shipped promptly on receipt of orders.

BUFFALO NO. 66 DRILL.—Two views of this machine are afforded by the cut. To say the least, it is the best low-priced drill yet placed upon the market. Cheap drills are not uncommon; the country is flooded with those made to sell, not to last. The Buffalo No. 66 is not one of this type. Its durability, efficiency and good features are unequaled. The sales have been surprisingly large and are still increasing, caused by the wide demand from blacksmiths who have had occasion to inspect it. Imitators have sought to counterfeit it. On every genuine machine, "Buffalo No. 66" appears. It has automatic feed, adjustable for three feeds; there are two rates of speed. The distance from lowest point of table to spindle is 16½ inches; table is 8 inches in diameter. A hand wheel is provided for the quick return of spindle. Each machine is furnished with a wrench, and the chuck is made for ½-inch drill shank.

BUFFALO NO. 67 DRILL.—This machine is identically the same as the Buffalo No. 66, excepting that it is built for power, with tight and loose pulleys.

BUFFALO NO. 69 DRILL.—This is the lowest priced drill manufactured by this house. It is valuable for light work, where a hand feed drill is desired. The chuck is made for 1½-inch drill shank.

BUFFALO NO. 71 DRILL.—This machine is triple-geared, as well as Nos. 71 to 74, inclusive, and the speed may be made either fast or slow by changing the handle from front to rear shaft. This feature increases the respective capacities nearly one-third. There are four rates of speed. Chucks are made for ½-inch drill shank.

BUFFALO NO. 71½ DRILL.—Identically the same in construction and design as No. 71, excepting the machine is supplied with tight and loose pulleys for power.

BUFFALO NO. 72 DRILL.—A power machine and the same as No. 71, with the exception it is supplied with an emery grinder.

BUFFALO NO. 72½ DRILL.—This power drill is the same as No. 71½, excepting that it has the addition of an emery grinder, which further enhances its value in many lines of manufacture.

BUFFALO NO. 73 DRILL.—This hand and power machine is the same in design as the No. 74, with the exception it is not furnished with the emery wheel illustrated by the cut.

Buffalo Blacksmith Drills.

(CONTINUED.)

BUFFALO NO. 74 DRILL.—The engraving clearly illustrates the construction of this valuable tool. It has four rates of speed, and is especially designed for heavy work. The elements of rigidity and strength are disposed to the best advantage. It is triple-gearied, with automatic feed.

BUFFALO NO. 75 DRILL.—Same in every respect as No. 74, excepting that it is built as a hand and power machine with tight and loose pulleys, but without emery grinder. The cut fully shows the construction.

BUFFALO NO. 76 DRILL.—This machine is a hand and power machine, and identical in construction with No. 75, excepting that it has the addition of an emery wheel.

BUFFALO NO. 77 DRILL.—This drill is the No. 75 hand and power machine, but built with countershaft, the construction of which is clearly illustrated by the accompanying engravings.

BUFFALO NO. 78 DRILL is the same machine as the No. 77, it having the further addition of an emery grinder. This makes a very convenient and complete tool for a large variety of work, and we can especially recommend it.

BUFFALO NO. 79 DRILL is a combination hand and power tool, triple-gearied, and with automatic feed. It is somewhat heavier and of larger capacity than the No. 75 type. The cut of drill No. 81 illustrates this drill without the countershaft.

BUFFALO NO. 80 DRILL.—Same in construction as the No. 79, but having the additional feature of the emery wheel, which is often indispensable.

BUFFALO NO. 81 DRILL is a hand and power drill, the same as No. 79, excepting that the machine is furnished with a countershaft, which is well shown in the wood cut.

BUFFALO NO. 82 DRILL.—This hand and power machine with countershaft is precisely the same as No. 81, excepting that it is furnished with the emery wheel. In smoothness of action, these drills are unexcelled. Every drill has one-fourth inch hole in chuck which, however, unscrews to admit of an adjustable chuck or any attachment desired.

BUFFALO NO. 83 DRILL.—A lever feed drill, and well illustrated in the cut. For work requiring a drill of this type, it is especially convenient, and we unhesitatingly recommend it as embodying every desirable feature.

BUFFALO NO. 84 LEVER DRILL is the same as No. 83, excepting the machine is supplied with a countershaft. The countershaft is of design quite similar to the one appearing with drill No. 87.

BUFFALO NO. 85 LEVER DRILL.—Same as No. 83, with the exception that tight and loose pulleys are supplied instead of the cone pulley.

BUFFALO NO. 86 DRILL.—A lever drill with tight and loose pulleys exactly the same as No. 85, but furnished with a countershaft.

BUFFALO NO. 87 DRILL.—Among carriage and wagon manufacturers, this drill has met with wide favor, and is in large demand. This power drill is of the lever type, and the countershaft is a model of neatness. A special attachment is supplied for carrying the wheels when drilling the tire, and is placed at the side of the table, which may be swung around in order to admit the wheel on spindle being brought in line with drill shank. Countershaft cone has four changes. The hanger and shifter are cast in one piece.

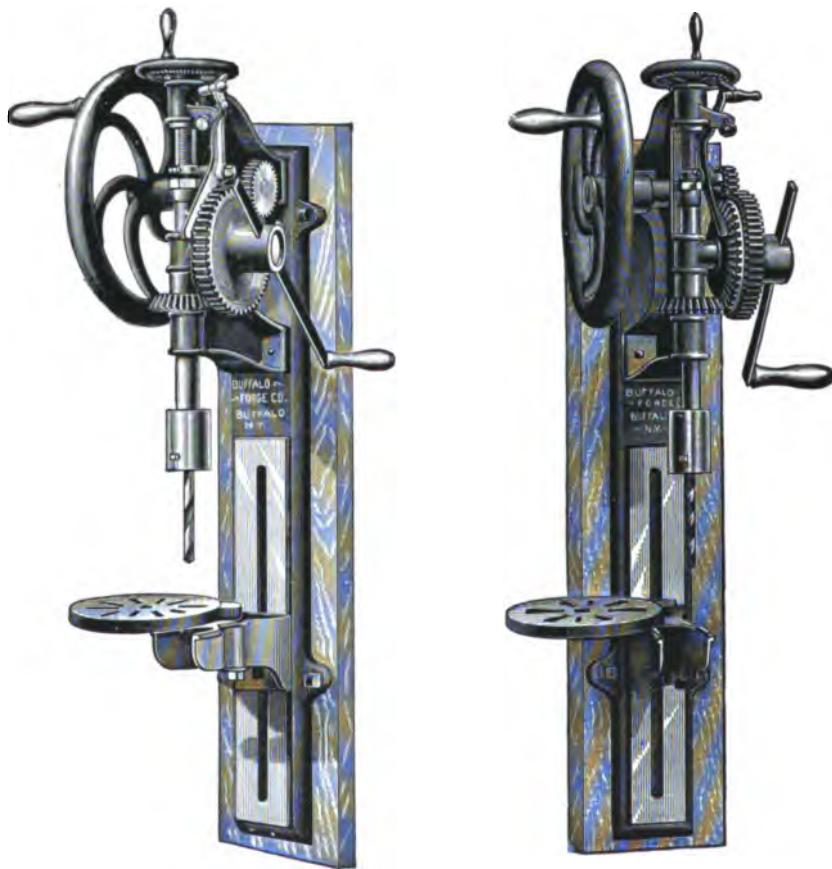
Buffalo Blacksmith Drills,

Price List, Sizes and Dimensions.

NUMBER	DESCRIPTION	LENGTH	WEIGHT	CAPACITY	COUNTERSHAFT PULLEYS		PRICE
					FACE	DEPTH	
66	Hand Drill, Adjustable Automatic Feed	37 in.	100 lbs.	1 in. hole center, 15 in. circle. from $\frac{1}{8}$ to $\frac{7}{8}$ in. center, 9 in. circle.	3 $\frac{1}{4}$	4	\$ 22.00
67	Power " " " " "	37 "	100 "	1 " " " 15 " " "	3 $\frac{1}{4}$	4	28.00
69	Hand Feed	28 "	55 "	"	3 $\frac{1}{4}$	4	15.00
71	Automatic Feed, Triple Gear	44 "	125 "	" $\frac{3}{8}$ to $1\frac{1}{4}$ "	5	4	36.00
71 $\frac{1}{2}$	Same as above for power	44 "	125 "	" $\frac{3}{8}$ to $1\frac{1}{4}$ " " 11 " " "	5	4	40.00
72	Same as 71 with Emery Grinder	44 "	125 "	" $\frac{3}{8}$ to $1\frac{1}{4}$ " " 11 " " "	5	4	38.00
72 $\frac{1}{2}$	Same as 71 $\frac{1}{2}$ with Emery Grinder	44 "	125 "	" $\frac{3}{8}$ to $1\frac{1}{4}$ " " 11 " " "	5	4	42.00
73	Upright Triple Gear, Automatic Drill	54 "	175 "	" $\frac{3}{8}$ to $1\frac{1}{4}$ " " 15 " " "	5	4	46.00
74	" " " " " with Emery Grinder	54 "	175 "	" $\frac{3}{8}$ to $1\frac{1}{4}$ " " 15 " " "	5	4	48.00
75	Same as 73 but Combined Hand and Power Machine . . .	54 "	175 "	" $\frac{3}{8}$ to $1\frac{1}{4}$ " " 15 " " "	5	4	52.00
76	Same as 75 with Emery Wheel	54 "	175 "	" $\frac{3}{8}$ to $1\frac{1}{4}$ " " 15 " " "	5	4	54.00
77	Same as 75 with Countershaft	54 "	175 "	" $\frac{3}{8}$ to $1\frac{1}{4}$ " " 15 " " "	5	4	66.00
78	Same as 77 with Emery Wheel	54 "	175 "	" $\frac{3}{8}$ to $1\frac{1}{4}$ " " 15 " " "	5	4	68.00
79	Hand and Power Triple Gear	54 "	200 "	" $\frac{3}{8}$ to $1\frac{1}{4}$ " " 15 " " "	8 in.	3 $\frac{1}{4}$ in.	52.00
80	Same as 79 with Emery Wheel	54 "	200 "	" $\frac{3}{8}$ to $1\frac{1}{4}$ " " 15 " " "	8 "	3 $\frac{1}{4}$ "	54.00
81	Same as 79 with Countershaft	54 "	200 "	" $\frac{3}{8}$ to $1\frac{1}{2}$ " " 15 " " "	8 "	3 $\frac{1}{4}$ "	65.00
82	Same as 81 with Emery Wheel	54 "	200 "	" $\frac{3}{8}$ to $1\frac{1}{2}$ " " 15 " " "	8 "	3 $\frac{1}{4}$ "	67.00
83	Lever Drill without Countershaft	50 "	145 "	drills to center 13 in. circle.	8 "	3 $\frac{1}{4}$ "	65.00
84	Lever Drill with Countershaft	50 "	145 "	" " " 13 " " "	8 "	3 $\frac{1}{4}$ "	75.00
85	Lever Drill with Tight and Loose Pulleys (in place of Cone)	50 "	145 "	" " " 13 " " "	8 "	3 $\frac{1}{4}$ "	65.00
86	Lever Drill with Tight and Loose Pulleys and Countershaft.	50 "	145 "	" " " 13 " " "	8 "	3 $\frac{1}{4}$ "	75.00
87	Lever Drill with Countershaft	66 "	250 "	" " " 20 " " "	8 "	3 $\frac{1}{4}$ "	120.00

Buffalo Blacksmiths' Drills,

With Automatic Feed.



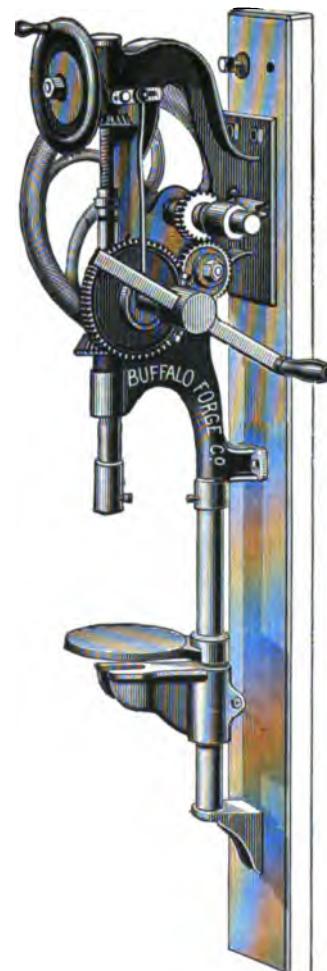
Buffalo "66."—Two Views.

Buffalo Blacksmiths' Drills,

With Hand and Automatic Feed.



Hand Feed Drill No. 69.



Automatic Feed Drill No. 71.

Buffalo Blacksmiths' Drills,

With Automatic Feed, Triple Gear.



Drill No. 74, with Emery Grinder.



Hand and Power Drill No. 75.

Buffalo Blacksmiths' Drills,

Triple Geared, Automatic and Lever Feeds.



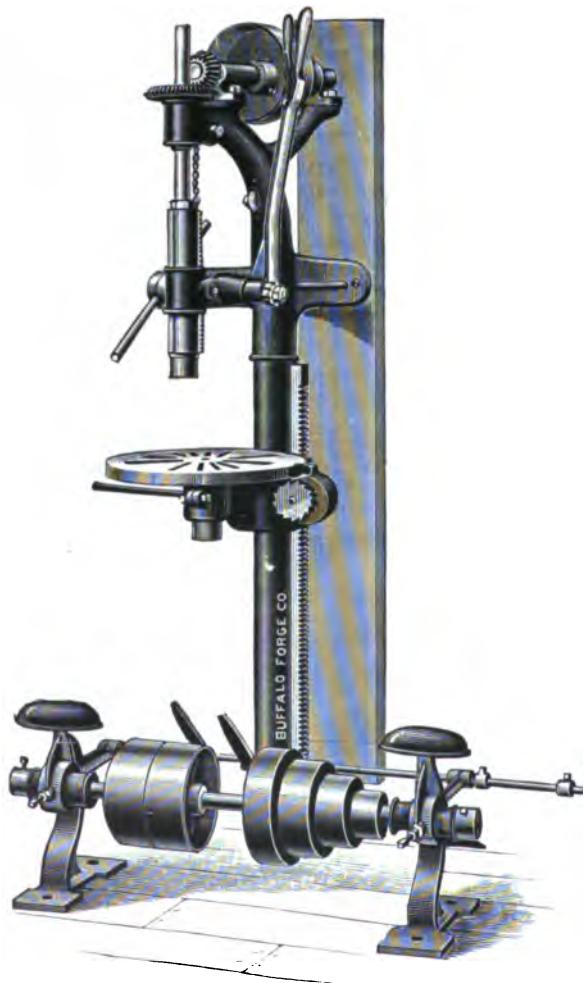
Combined Hand and Power Drill No 81



Power Drill, Lever Feed, No. 83.

Buffalo Blacksmiths' Drill,

Specially Adapted for Carriage and Wagon Manufactories.



Power Drill No. 87.

Catalogues of Various Buffalo Machines,

Issued in Sectional Forms.

INSTRUCTIONS TO DEALERS.

FOR the convenience of customers who are not often at one time in the market for several of the different kinds of machines built by this house, and who would, therefore, not be interested in a complete catalogue, we publish sectionals giving full detailed information regarding the various branches of our work. The especial subject in which a purchaser may be interested, can be concisely brought to his attention by the use of one of these sectional publications, and without searching through a large volume containing a great deal of matter of value to others, but which would have no bearing in that particular case. Dealers are, therefore, requested to keep a supply of the various sectional circulars constantly on hand. In ordering additional copies of any of the different catalogues, simply refer to the titles given below, stating the number desired of each one. Price lists of the machines described are embodied in each of the different sectional circulars. Below we enumerate all of the separate regular catalogues published by this house, as follows:

ILLUSTRATED GENERAL CATALOGUE.—This is the present work, and consists of 288 pages, It is furnished in two editions; first, bound in library or full cloth style, and second, bound on a lighter weight of paper, and with cloth back and re-inforced four-ply manilla stock sides. This catalogue contains the most comprehensive data regarding the applications of all types of blowers and fans, for every service, yet presented, and is in extensive demand by engineers.

ILLUSTRATED SECTIONAL CATALOGUE "B," 92, describes in detail the Buffalo Steam Hot Blast System of Heating, Ventilating and Drying. This work contains 156 pages with index, and is substantially bound with a special quality of cover stock, made expressly for the purpose, with embossed design in colors. The first 156 pages of the general catalogue are embodied herein. This catalogue will be employed for all customers in the market for steam engines, steam heating and ventilating apparatus, also drying apparatus, steel plate steam and pulley fans, and blowers for forced draft under steamboat boilers and batteries of stationary boilers.

ILLUSTRATED SECTIONAL CATALOGUE "C," 92, is descriptive of Buffalo Pulley Disk Wheels, Engine Disk Wheels and Electric Disk Wheels. Their application to all classes of work for which this type of fan is suited is fully shown. The catalogue contains 24 pages, and is embellished with a wide variety of special cuts, showing applications to a great variety of work. The printing is upon super-calender special paper in an art ink.

ILLUSTRATED SECTIONAL CATALOGUE "D," 92.—In this catalogue will be found a full description of Buffalo Steel Plate Planing Mill Exhausters, and their application to various wood-working machinery. A large number of cuts of detail appear in this circular, which are not given in the general edition, owing to lack of space in the latter. The catalogue consists of 24 pages, and is bound in heavy coated paper, printed in a tinted ink. It should be in the hands of every purchaser of wood-working machinery.

ILLUSTRATED SECTIONAL CATALOGUE "E," 92—Buffalo Cotton Elevators, which are used extensively throughout the South for handling this material, are fully described in this small circular, which consists of only eight pages. Like the majority of catalogues issued by this house, it is printed on an excellent quality of paper, and in black ink. The matter presented therein will be found of value to every owner of a cotton gin.

ILLUSTRATED SECTIONAL CATALOGUE "F," 92, contains a complete detailed description of Buffalo Steel Pressure Blowers for cupola furnaces and forge fires, also Buffalo Improved Countershafts, Blast Gates, etc. This catalogue contains 32 pages of the same size as employed for the present book, and

Catalogues of Various Buffalo Machines,

Issued in Sectional Forms.

(CONTINUED.)

a special extra heavy book paper has been selected. Foundrymen will find considerable interest in a perusal of this complete circular. The machines described are suitable for all uses requiring air at high pressures. Pages 156 to 205 of the present catalogue are embodied in the above.

ILLUSTRATED SECTIONAL CATALOGUE "G," 92, consists of 32 pages, taken from the general catalogue, and numbered from 203 to 225. Buffalo "B" Blowers and Exhausters usually are termed the "Volume" type of fans, and are suited for all work requiring the movement of air in large volumes at moderately heavy pressures. The "B" Volume Blowers are used for blowing forge fires, and the Volume Exhausters for removing the smoke from same, and handling the refuse from buffing wheels, emery wheels polishing spindles, etc.

ILLUSTRATED SECTIONAL CATALOGUE "H," 92.—This special folder describes the various Buffalo Stationary Blast Forges, which are so widely used in blacksmith shops of the largest manufactories throughout the country. This should fall into the hands of every owner of a large blacksmith shop where a stationary blower is employed for supplying the blast to the forges, and where heavy work is performed.

ILLUSTRATED SECTIONAL CATALOGUE "I," 92.—This leaflet describes the nine designs of heating forges built by this house; they are suitable for a great variety of work, such as heating rivets, bolts, rods, axles, hammers, hatchets, band iron, etc., and will be found especially advantageous for use in connection with steam hammers and steam and hydraulic riveting machines. Eight pages.

ILLUSTRATED SECTIONAL CATALOGUE "J," 92, describes Buffalo Portable Forges for blacksmiths, machinists and all others requiring the use of a hand forge or blower. In this catalogue are also illustrated Buffalo Blacksmith Drills, Buffalo Punch, Shear and Bar Cutters, and the general line of blacksmith tools which we build. This circular is issued on French Folio paper, in 100,000 lots, and a quantity should always be at command, so that intending purchasers of these machines may select the type which will be best suited to their needs, as a full description of all is given. Several 100,000 editions are issued yearly, and the endeavor is to reach every blacksmith shop in the world with this catalogue.

ILLUSTRATED SECTIONAL CATALOGUE "K," 92.—Buffalo Combined Punch, Shear and Bar Cutters, Continuous Shears, and Independent Punches are the subject of this edition. Every boilermaker, sheet-iron worker and large general manufacturer is interested in these tools, as hardly a shop can be found where they will not be of great convenience and value. As labor savers they are unsurpassed. The catalogue consists of eight pages, with several half-tone cuts made from photographs of operators using the machines for the wide variety of work to which they are suited.

ILLUSTRATED SECTIONAL CATALOGUE "L," 92.—This is intended exclusively for those interested in clay-working industries. The Buffalo "Hot Blast System," for drying brick, drain and ornamental tile, terra cotta, and many special products in this line, is fully described by the half-tone cuts and wood engravings of the machinery employed for the purpose, with descriptions thereof.

ILLUSTRATED SECTIONAL CATALOGUE "M," 92.—We have endeavored to embody in this, much valuable data and information concerning the Buffalo Hot Blast System of drying lumber and other products using timber as a basis. This catalogue should also be sent to parties requiring special drying work, such as starch crusting, tobacco curing and drying of granular substances, paper, wood fibre, silk, woolen stock, etc.

MISCELLANEOUS CIRCULARS.—We are constantly making improvements and bringing out new tools, and these are made the subject of special small circulars, but are always gotten out in attractive style.

Among those recently completed and of suitable size for mailing in an ordinary envelope, are circulars of Improved Buffalo Blacksmith Drills, half-tone cuts of prominent training schools outfitted with Buffalo Forges, Blowers, Exhausters, Hoods, Piping, etc., improvements in the line of Punches and Shears, slips of duplicate parts of Portable Forges, Hand Blowers, etc., in all the different sizes, etc.

Aside from the above, testimonial letters, in fac simile, covering the various lines of our manufacture are attractively gotten out, in convenient form for mailing, and we shall be happy at all times to furnish a supply of any of the above upon request.

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